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N00014-67-A-0094-0031
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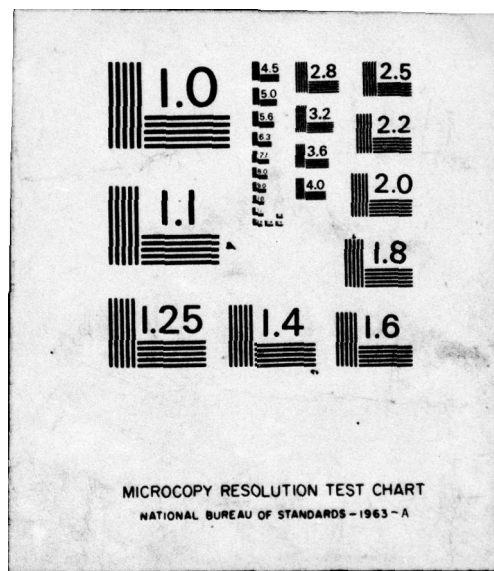
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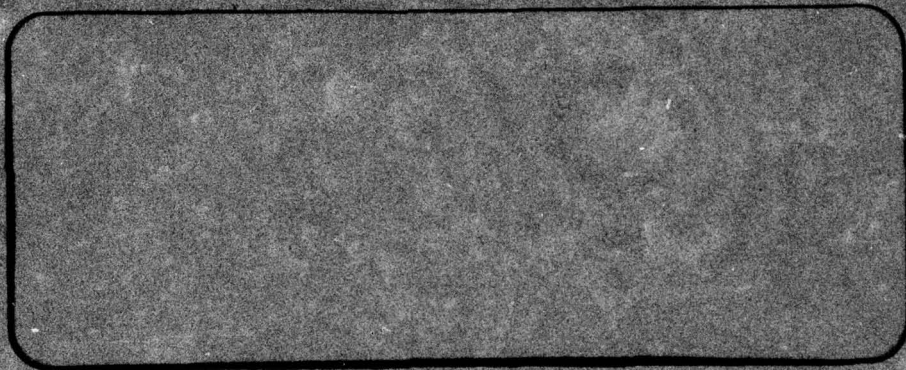


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Non Linear Calculation of Supercavitating
Hydrofoils Near a Free Surface

by

A. J. Acosta and O. Furuya

Eng. 193.1

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COMMAND GENERAL HYDROMECHANICS RESEARCH
PROGRAM - ADMINISTERED BY THE DAVID W.
TAYLOR NAVAL SHIP RESEARCH AND DEVELOP-
MENT CENTER, BETHESDA, MD 20084 -
Contract N00014-67-A-0094-0031
Contract N00014-75-C-0430



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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report summarizes briefly the research carried out under the Contracts N00014-67-A-0094-0031 and N00014-75-C-0430 on the calculation of supercavitating hydrofoils near a free surface. This work appears in six previous publications. The present report concludes this series of publications with a users list of instructions for the calculation of supercavitating hydrofoils of finine aspect ratio near gravity-free surface.		

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Non Linear Calculation of Supercavitating
Hydrofoils Near a Free Surface

Final Report

by

A. J. Acosta and O. Furuya
Division of Engineering and Applied Science
California Institute of Technology

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June 1976

Eng. 193.1

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Sea Systems Command General Hydromechanics
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Contracts N00014-67-A-0094-0031 and
N00014-75-C-0430

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1. Introduction. This report summarizes briefly the research carried out under the Contract N00014-67-A-0094-0031 on the calculation of supercavitating hydrofoils near a free surface. This work appears in six previous publications. Two of these were supported in part by another Department of the Navy agency (the Office of Naval Research^{*}). The present report concludes this series of publications with a users list of instructions for the calculation of supercavitating hydrofoils of finite aspect ratio near gravity-free surface.

2. Publications.

2.1 "Nonlinear calculation of arbitrarily shaped supercavitating hydrofoils near a free surface" by O. Furuya, J. Fl. Mech., 1975, Vol. 68, part 1, pp. 21-40.

2.2 "Exact Supercavitating Cascade Theory" by O. Furuya, J. Fl. Engr. (ASME) 1975, pp. 419-429.

2.3 "A Note on Three-Dimensional Supercavitating Hydrofoils", by A. J. Acosta and O. Furuya, J. Ship Res., 1975, Vol. 19, No. 3, pp. 164-65.

2.4 "Three-dimensional theory on supercavitating hydrofoils near a surface", J. Fluid Mech., 1975, Vol. 71, Part 2, pp. 339-359.

2.5 "Numerical Procedures for the Solution of Two-Dimensional Supercavitating Flows near a Free Surface" by O. Furuya, 1975, Conference on Numerical Methods in Ship Hydrodynamics, Naval Ship Research and Development Center, Bethesda, Md., (with partial support by Tetra-Tetra-Tech Inc., Pasadena, Ca.).

2.6 "An Experimental Study of a Supercavitating Finite Aspect Ratio Hydrofoil Near a Free Surface", by O. Furuya, A. J. Acosta, 1976, ONR Eleventh Symposium on Naval Hydrodynamics, London.

3. Discussion. The basic concept of the present work as outlined in publication 2.1 was the exploitation of the non-linear free streamline theory of Wu and Wang (see e.g. Wu, 1972 "Cavity and Wake Flows" Ann. Rev. Fluid Mech. 4, 243-284) by introducing an additional method of determining the constants of the non-linear equations to be solved. This

* ONR Contract N00014-67-A-0094-0021

method enabled the much more difficult cascade problem to be tackled with success (publication 2.2). The two-dimensional non-linear free streamline calculations are embodied in a linear finite aspect-ratio correction in publication 2.4 for flat plate foils. Experiments were reported in publication 2.b which show that the present theory accounts nicely for the observed data.

In the next section, the computer program listing together with a description of the input cards for the finite aspect ratio correction effect (publication 2.4) is given. The important geometrical characteristics of the foil are given in data cards 4 and 5 and the plan form shape in section 4.2. In the present program listing (section 4.5) the chord length description is fixed. The plan form is linearly tapered from one half of the semi-span to the tip where the tip chord length is one-half that of the base chord. This plan-form distribution may be changed as desired following statement number 1131 of the program listing section 4.5. An example of input data is given in section 4.3 and the output from this data is given in section 4.4.

4. An Instruction Note on Computer Code ^{*1†}
of Three-Dimensional Supercavitating Hydrofoils Near a Free Surface

Input Symbol Descriptions

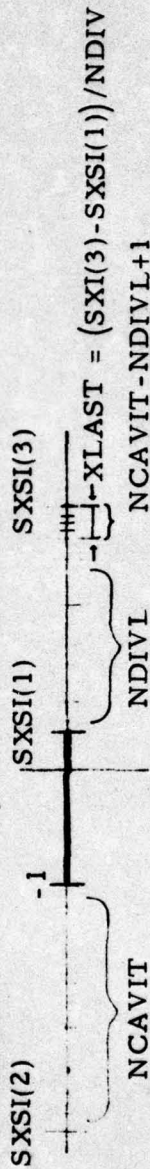
4.1 Input Data Symbol

Data Card No. 1 X34LA

This value sets a limit between x(3) and x(4), beyond which a different method is used in the program ^{*2}.

NDIV

Increments on the cavity are used as shown below.



Data Card No. 2 NSIP

If NSIP = 0, LAST control point over the span must be shifted from the regular set-up ^{*3}, NSIP = 1 for the regular set-up.

NNISP

Specifies shift in such a way that the last position measured from the foil center becomes $\cos(\pi/8 + NNISP/64) * (HALF \text{ SPAN LENGTH})$.

Data Card No. 3 NITER

Number of cases to be run.

MSTOP

Number of iterations to stop the small loop of iteration. ^{*4} ($\equiv NCON$)

MAXIT

Number of iterations for the Newton's iterations

NHK

Control index for parameters; NHK = 1 for changing angles of attack ALFA1, = 2 for maximum length of chord XOLS; = 3 for submergence depth, HHHS; = 4 for cavitation number SIGMA.

KSTOP

Number of iterations to stop the big loop of iterations. ^{*4}

NCON

Number of iteration to stop the small loop at each span position. ^{*4}

† The asterisks refer to notes at the end of this section.

<u>4.1 Input Data</u>		<u>Symbol</u>	<u>Description</u>
Data Card No. 4	ALFAZS		Attack angle of the foils (degree).
	HHHS		Submergence depth normalized by the base chord length.
	DE		Small quantity for numerical derivatives.
	SIGMS		Cavitation number
	SIGINC		Increment of cavitation number in successive computation for $NITER \geq 2$.
Data Card No. 5	ASP		Aspect ratio ($= \text{Span}^2 / \text{AREA}$).
	EPSQ		Limits of the difference between the intermediate velocities calculated from inner and outer solutions. *5
	XXM		Weighting function of the iteration method.
Data Card No. 6	FGAP		Increment for Simpson rule to find the free surface shape for $\chi > FLI$.
	FFGAP		Increment for Simpson rule to find the free surface shape for $\chi \leq FLI$.
	XLIMIT		Identical to X34LA.
	FLI		A position of the free surface beyond which the increment of FFGAP is used and before which that of FFGAP is used.
Data Card No. 7	NFSUR1		Number of increments between $\chi(3)$ and $\chi(4)$ if $(\chi(4) - \chi(3)) > X34LA$.
	NFSUR2		Number of increments between $\chi(3)$ and $\chi(4)$ if $(\chi(4) - \chi(3)) < X34LA$.
	MONK		Number of increments points beyond which the free surface shape stopped.
	NG01		NG01 = 0, calculation of the free surface shape; NG01 \neq 0 not calculation of the free surface.
	NG02		NG02 = 0, printing of CP.
	NG03		NG03 = 0, printing of ROP, SMA, X00, ETC for F(5) in [1].

4.1 Input Data

Symbol

Description

Data Card No. 8 } $\left\{ \begin{array}{l} \text{CIRC�(1)} \\ \text{CIRC�(4)} \end{array} \right\}$
 No. 11 }

Values of circulations at four spanwise positions.

Where the spanwise positions are $\cos(n\pi/8)$ for $n = 4, \dots, 1$.

Data Card No. 12 } $\left\{ \begin{array}{l} \text{PSSD(1)} \\ \text{PSSD(4)} \end{array} \right\}$
 No. 15 }

Values of Ψ_0 at four spanwise positions where they are based on $1/\text{ASPI}$; i. e., $\text{PSSD} \approx \text{HHH}/\text{ASPI}$.

Data Card No. 16 SXSI(1) ~ SXSI(4)

Values of $X(1), \dots, X(4)$ at four spanwise positions.

NOTES

*1 See publication 2.4 for general formulation of the problem.

*2 See publication 2.4 for more details of instability which occurs when $\chi(3)$ and $\chi(4)$ becomes very close to each other.

*3 The last control point needs shift inwardly quite often since the supercavitation conditions does not hold at such a position.

*4 See Figure 6 in publication 2.4.

*5 See Eq. (33) in publication 2.4.

4.2 Input of Planform Shape

After Statement Number (SN)511

BIGO: Base chord length: Actual base chord length
 (any number in any unit divided by aspect ratio.)

After SN 1131

BIG: Specify the chord length based on BIGO ($\equiv \text{BIG}$ at the base centerline).

4.3 Typical Input Data Deck

4.3.1 Format of Input Data (continued overleaf)

[illegible][illegible][illegible]

Card No. 7

[illegible]

Card No. 8 ~ No. 11 ($I = 1, \sim 4$)

CIR CN(I)

[illegible]

Card No. 12 ~ No. 15 (I = 1 ~ 4)

PSSD(I)

[illegible]

4.4 An Output Example Corresponding to the above Input Data Set-ups

```

*****LAST CONTROL POINT ON SPAN IS*****PAI/8*PAI* 3/64
-----ALFA ZERC= 0.1500000E 02-----HHH= 0.1000000E 01
INITIAL CIRCNI 1)= 0.1076066E 00
INITIAL CIRCNI 2)= 0.1057253E 00
INITIAL CIRCNI 3)= 0.8170491E-01
INITIAL CIRCNI 4)= 0.6288004E-01
CAVIT. NO = 0.1289999E 00
PSIZ( 1)= 0.2513700E 01
PSIZ( 2)= 0.2545892E 01
PSIZ( 3)= 0.2497925E 01
PSIZ( 4)= 0.2527958E 01
DOWN WASH ANGLE IN DEGREE= 0.2637746E 01
-----POSITION OF SPAN----- 1 NO. OF ITER.= 1
BIGS= 0.2285714E 01 ISPAN= 1 AR= 0.4000000E 01
PSIZ= 0.2513700E 01
ITERATION NO.= 1
X(1)= 0.9207018E-02
X(2)= -0.2660373E 01
X(3)= 0.2464010E 00
X(4)= 0.1277719E-04
X(1)= 0.9207018E-02
X(2)= -0.2660373E 01
X(3)= 0.2464010E 00
X(4)= 0.1277719E-04
X(1)= 0.9329561E-02
X(2)= -0.2661556E 01
X(3)= 0.2470894E 00
X(4)= 0.3949363E-05
X(1)= 0.9039927E-02
X(2)= -0.2984368E 01
X(3)= 0.2463559E 00
X(4)= 0.7241350E-05
ITERATION NO.= 2
X(1)= 0.5035927E-02
X(2)= -0.2984368E 01
X(3)= 0.2463559E 00
X(4)= 0.7241350E-05
X(1)= 0.9193704E-02
X(2)= -0.2813456E 01
X(3)= 0.2467390E 00
X(4)= 0.7441017E-05
ITERATION NO.= 3
X(1)= 0.9193704E-02
X(2)= -0.2813456E 01
X(3)= 0.2467390E 00
X(4)= 0.7441017E-05
X(1)= 0.9201959E-02
X(2)= -0.2809869E 01
X(3)= 0.2467627E 00
X(4)= 0.7490128E-05
ITERATION NO.= 4
X(1)= 0.9201959E-02
X(2)= -0.2809869E 01
X(3)= 0.2467627E 00
X(4)= 0.7490128E-05
X(1)= 0.9203173E-02
X(2)= -0.2808363E 01

```

X(3)= 0.2467661E 00

X(4)= 0.7486973E-05

ITERATION NO.= 5

X(1)= 0.9203173E-02

X(2)= -0.2808363E 01

X(3)= 0.2467661E 00

X(4)= 0.7486973E-05

X(1)= 0.9203069E-02

X(2)= -0.2808512E 01

X(3)= 0.2467657E 00

X(4)= 0.7488665E-05

ITERATION NO.= 6

X(1)= 0.9203069E-02

X(2)= -0.2808512E 01

X(3)= 0.2467657E 00

X(4)= 0.7488665E-05

X(1)= 0.9203110E-02

X(2)= -0.2808448E 01

X(3)= 0.2467658E 00

X(4)= 0.7488482E-05

F(1)= -0.1192093E-06

F(2)= 0.4172325E-06

F(3)= -0.5894899E-04

F(4)= 0.0

P(1,1)= 0.1032651E 02

P(1,2)= -0.8554339E-02

P(1,3)= -0.3548251E-01

P(1,4)= 0.0

P(2,1)= -0.2371669E-02

P(2,2)= -0.1523760E-02

P(2,3)= -0.6038589E-01

P(2,4)= 0.2578644E 04

P(3,1)= 0.0

P(3,2)= 0.0192330E 00

P(3,3)= -0.1596952E-01

P(3,4)= -0.1000010E 01

P(4,1)= -0.2727509E 02

P(4,2)= -0.3735224E-02

P(4,3)= 0.1294673E 02

P(4,4)= 0.0

SXSI(1)= 0.9203110E-02

SXSI(2)= -0.2808448E 01

SXSI(3)= 0.2467658E 00

SXSI(4)= 0.7488482E-05

-----CIPCN(1)= 0.1065345E 00

CLIFT= 0.3281366E 00 CDFAG= 0.9722365E-01 CMOMENT=-0.6231614E 00 L/D= 0.3732763E 01

LIFT DRAG COEFFTS-BASED ON U1-----CLD=-0.3704661E-00 CDD=-0.9926575E-01

RCP= 0.2471761E 00

RCP= 0.2484179E 00

RCP= 0.2505059E 00

RCP= 0.2534707E 00

RCP= 0.2573553E 00

RCP= 0.2622178E 00

RCP= 0.2691328E 00

AG(1)= 0.1132367E 00

AG(2)= 0.4418985E-07

AG(3)= 0.5153619E-02

AG(4)= 0.1561457E-07

AG(5)= -0.1182862E-02

AG(6)= 0.1695681E-07

AG(7)= 0.1659336E-02

TGA= 0.1778718E 00 CL30= 0.3557435E 00

DOWN WASH ANGLE IN DEGREE= 0.3323103E 01

-----POSITION OF SPAN----- 2 NO. OF ITER.= 1

BIGS= 0.2285714E 01 ISPAN= 2 AR= 0.4000000E 01

PSIZ= 0.2545892E 01

ITERATION NO.= 1

X(1)= 0.8242488E-02
X(2)= -0.2503046E 01
X(3)= 0.2466283E 00
X(4)= 0.2328349E-04
X(1)= 0.8242488E-02
X(2)= -0.2503046E 01
X(3)= 0.2466283E 00
X(4)= 0.2328349E-04
X(1)= 0.8337248E-02
X(2)= -0.2508996E 01
X(3)= 0.2472352E 00
X(4)= 0.8345156E-05

ITERATION NO.= 1

X(1)= 0.8337248E-02
X(2)= -0.2508996E 01
X(3)= 0.2472352E 00
X(4)= 0.8345156E-05
X(1)= 0.8077685E-02
X(2)= -0.2792370E 01
X(3)= 0.2465568E 00
X(4)= 0.1427478E-04

ITERATION NO.= 2

X(1)= 0.8077685E-02
X(2)= -0.2792370E 01
X(3)= 0.2465568E 00
X(4)= 0.1427478E-04
X(1)= 0.8216053E-02
X(2)= -0.2640360E 01
X(3)= 0.2469304E 00
X(4)= 0.1409924E-04

ITERATION NO.= 3

X(1)= 0.8216053E-02
X(2)= -0.2640360E 01
X(3)= 0.2469304E 00
X(4)= 0.1409924E-04
X(1)= 0.8215643E-02
X(2)= -0.2647099E 01
X(3)= 0.2469245E 00
X(4)= 0.1431652E-04

ITERATION NO.= 4

X(1)= 0.8215643E-02
X(2)= -0.2647099E 01
X(3)= 0.2469245E 00
X(4)= 0.1431652E-04
X(1)= 0.8218981E-02
X(2)= -0.2643114E 01
X(3)= 0.2469335E 00
X(4)= 0.1424802E-04

ITERATION NO.= 5

X(1)= 0.8218981E-02
X(2)= -0.2643114E 01
X(3)= 0.2469335E 00
X(4)= 0.1424802E-04
X(1)= 0.8217994E-02
X(2)= -0.2644308E 01
X(3)= 0.2469308E 00
X(4)= 0.1426962E-04

ITERATION NO.= 6

X(1)= 0.8217994E-02
X(2)=-0.2644308E 01
X(3)= 0.2469308E 00
X(4)= 0.1426962E-04
X(1)= 0.9218329E-02
X(2)=-0.2643873E 01
X(3)= 0.2469317E 00
X(4)= 0.1426259E-04

ITERATION NO.= 7

X(1)= 0.8218329E-02
X(2)=-0.2643873E 01
X(3)= 0.2469317E 00
X(4)= 0.1426259E-04
X(1)= 0.8218195E-02
X(2)=-0.2644014E 01
X(3)= 0.2469314E 00
X(4)= 0.1426545E-04

ITERATION NO.= 8

X(1)= 0.8218195E-02
X(2)=-0.2644014E 01
X(3)= 0.2469314E 00
X(4)= 0.1426545E-04
X(1)= 0.8218285E-02
X(2)=-0.2643957E 01
X(3)= 0.2469316E 00
X(4)= 0.1426347E-04
F(1)= 0.4768372E-06
F(2)= 0.4768372E-06
F(3)= 0.5280972E-04
F(4)= 0.9526743E-06
P(1,1)= 0.1099408E 02
P(1,2)=-0.9247772E-02
P(1,3)=-0.3539454E-01
P(1,4)= 0.0
P(2,1)= 0.2509952E 02
P(2,2)=-0.1745240E-02
P(2,3)=-0.4827639E-01
P(2,4)= 0.1353662E 04
P(3,1)= 0.0
P(3,2)= 0.9145846E-00
P(3,3)= 0.1545643E 01
P(3,4)=-0.1000000E 01
P(4,1)=-0.2875328E 02
P(4,2)=-0.4147954E-02
P(4,3)= 0.1293805E 02
P(4,4)= 0.0

SXSI(1)= 0.8218285E-02
SXSI(2)=-0.2643957E 01
SXSI(3)= 0.2469316E 00
SXSI(4)= 0.1426347E-04

-----CIRCHI 2)= 0.1325797E 00

CLIFT= 0.3147572E 00 CDRAG= 0.8433849E-01 CMOMENT= 0.5957999E-01 L/D= 0.3732069E 01

-----LIFT DRAG COEFFTS BASED ON U1-----CLD= 0.3553608E 00 CDD= 0.9521812E-01

RCP= 0.2473422E 00
RCP= 0.2485848E 00
RCP= 0.2506743E 00
RCP= 0.2536411E 00
RCP= 0.2575283E-00
RCP= 0.2623940E 00
AG(1)= 0.1132367E 00
AG(2)= 0.4418985E-07

AG(3)= 0.5153619E-02
AG(4)= 0.1560457E-07
AG(5)= 0.1182862E-02
AG(6)= 0.1695681E-07
AG(7)= 0.1659336E-02

TGA= 0.1778718E 00 CL3D= 0.3557435E 00

DOWN WASH ANGLE IN DEGREE= 0.3184720E 01

-----POSITION OF SPAN----- 3 NO. OF ITER.= 1

BIGS= 0.1812326E 01 ISPAN= 3 AR= 0.4000000E 01

PSIZ= 0.2497925E 01

ITERATION NO.= 1

X(1)= 0.8467928E-02
X(2)= -0.2631289E 01
X(3)= 0.2883134E 00
X(4)= 0.7743092E-04
X(1)= 0.8467928E-02
X(2)= -0.2631289E 01
X(3)= 0.2883134E 00
X(4)= 0.7743092E-04
X(1)= 0.8581232E-02
X(2)= -0.2632590E 01
X(3)= 0.2891010E 00
X(4)= 0.3176709E-04

ITERATION NO.= 1

X(1)= 0.8581232E-02
X(2)= -0.2632590E 01
X(3)= 0.2891010E 00
X(4)= 0.3176709E-04
X(1)= 0.8326214E-02
X(2)= -0.2923987E 01
X(3)= 0.2883216E 00
X(4)= 0.5074432E-04

ITERATION NO.= 2

X(1)= 0.8326214E-02
X(2)= -0.2923987E 01
X(3)= 0.2883216E 00
X(4)= 0.5074432E-04
X(1)= 0.8463100E-02
X(2)= -0.2767331E 01
X(3)= 0.2887381E 00
X(4)= 0.4871891E-04

ITERATION NO.= 3

X(1)= 0.8463100E-02
X(2)= -0.2767331E 01
X(3)= 0.2887381E 00
X(4)= 0.4871891E-04
X(1)= 0.8454569E-02
X(2)= -0.2783653E 01
X(3)= 0.2897146E 00
X(4)= 0.4983188E-04

ITERATION NO.= 4

X(1)= 0.8454569E-02
X(2)= -0.2783653E 01
X(3)= 0.2897146E 00
X(4)= 0.4983188E-04
X(1)= 0.8460645E-02
X(2)= -0.2776263E 01
X(3)= 0.2887304E 00
X(4)= 0.4948155E-04

ITERATION NO.= 5

X(1)= 0.8460645E-02
X(2)= -0.2776263E 01

X(3)= 0.2887304E 00
 X(4)= 0.4948155E-04
 X(1)= 0.8452689E-02
 X(2)=-0.2778647E 01
 X(3)= 0.2887252E-00
 X(4)= 0.4961170E-04

ITERATION NO.= 6

X(1)= 0.8452689E-02
 X(2)=-0.2778647E 01
 X(3)= 0.2887252E 00
 X(4)= 0.4961170E-04
 X(1)= 0.8459397E-02
 X(2)=-0.2777766E 01
 X(3)= 0.2887276E 00
 X(4)= 0.4956513E-04

ITERATION NO.= 7

X(1)= 0.8459397E-02
 X(2)=-0.2777766E 01
 X(3)= 0.2887276E 00
 X(4)= 0.4956513E-04
 X(1)= 0.8459136E-02
 X(2)=-0.2778087E 01
 X(3)= 0.2887267E 00
 X(4)= 0.4958463E-04

ITERATION NO.= 8

X(1)= 0.8459136E-02
 X(2)=-0.2778087E 01
 X(3)= 0.2887267E 00
 X(4)= 0.4958463E-04
 X(1)= 0.8459248E-02
 X(2)=-0.2777954E 01
 X(3)= 0.2887270E 00
 X(4)= 0.4957775E-04
 F(1)= 0.5960464E-07
 F(2)= 0.2900232E-06
 F(3)= 0.1205802E-03
 F(4)= 0.0
 P(1,1)= 0.1080335E 02
 P(1,2)=-0.8675333E-02
 P(1,3)=-0.3213135E-01
 P(1,4)= 0.0
 P(2,1)= 0.2318025E 02
 P(2,2)=-0.1700071E-02
 P(2,3)=-0.4128795E-01
 P(2,4)= 0.3894470E 03
 P(3,1)= 0.0
 P(3,2)= 0.0058545E-00
 P(3,3)= 0.1457059E 01
 P(3,4)= 0.1000000E 01
 P(4,1)=-0.2202988E 02
 P(4,2)=-0.2917921E-02
 P(4,3)= 0.8518197E 01
 P(4,4)= 0.0

SXSI(1)= 0.8459248E-02
 SXSI(2)=-0.2777954E 01
 SXSI(3)= 0.2887270E 00
 SXSI(4)= 0.4957775E-04

-----CIPCN(3)= 0.8086526E-01

CLIFT= 0.3127329E-00 CORAG= 0.8379596E-01 CMOMENT= 0.3719968E-00 L/D= 0.3732073E 01

-----LIFT DRAG COEFFTS BASED ON U1-----CLD= 0.3533753E 00 CDD= 0.9460557E-01

PCP= 0.2892071E 00
 PCP= 0.2906601E 00

RCP= 0.2931032E 00
PCP= 0.2965722E 00
RCP= 0.3011174E 00
PCP= 0.2068066E 00
AG(1)= 0.1132367E 00
AG(2)= 0.4418985E-07
AG(3)= 0.5153619E-02
AG(4)= 0.1560457E-07
AG(5)= 0.1182862E-02
AG(6)= 0.1695681E-07
AG(7)= 0.1659336E-02

TGA= 0.1778718E 00 CL30= 0.3557435E 00

DOWN WASH ANGLE IN DEGREE= 0.3859832E 01

-----POSITION OF SPAN----- 4 NO. OF ITER.= 1

RIGS= 0.1468048E 01 ISPAN= 4 AR= 0.4000000E 01

PSIZ= 0.2527958E 01

ITERATION NO.= 1

X(1)= 0.7614926E-02
X(2)=-0.2553866E 01
X(3)= 0.3352290E 00
X(4)= 0.3820076E-03
X(1)= 0.7614926E-02
X(2)=-0.2553866E 01
X(3)= 0.3352290E 00
X(4)= 0.3820076E-03
X(1)= 0.7799015E-02
X(2)=-0.2555338E 01
X(3)= 0.3360614E 00
X(4)= 0.1931238E-03

ITERATION NO.= 1

X(1)= 0.7799015E-02
X(2)=-0.2555338E 01
X(3)= 0.3360614E 00
X(4)= 0.1931238E-03
X(1)= 0.7481527E-02
X(2)=-0.2819305E 01
X(3)= 0.3352327E 00
X(4)= 0.2787148E-03

ITERATION NO.= 2

X(1)= 0.7481527E-02
X(2)=-0.2919305E 01
X(3)= 0.3352327E 00
X(4)= 0.2787148E-03
X(1)= 0.7606018E-02
X(2)=-0.2674354E 01
X(3)= 0.3357065E 00
X(4)= 0.2588183E-03

ITERATION NO.= 3

X(1)= 0.7606018E-02
X(2)=-0.2674354E 01
X(3)= 0.3357065E 00
X(4)= 0.2588183E-03
X(1)= 0.7584911E-02
X(2)=-0.2775381E 01
X(3)= 0.3356342E 00
X(4)= 0.2681287E-03

ITERATION NO.= 4

X(1)= 0.7584911E-02
X(2)=-0.2705391E 01
X(3)= 0.3356342E 00
X(4)= 0.2681287E-03
X(1)= 0.7596057E-02

X(2)=-0.2691542E 01
X(3)= 0.3356737E 00
X(4)= 0.2647419E-03

ITERATION NO.= 5

X(1)= 0.7596057E-02
X(2)=-0.2691542E 01
X(3)= 0.3356737E 00
X(4)= 0.2647419E-03
X(1)= 0.7592056E-02
X(2)=-0.2696611E 01
X(3)= 0.3356577E 00
X(4)= 0.2661108E-03

ITERATION NO.= 6

X(1)= 0.7592056E-02
X(2)=-0.2696611E 01
X(3)= 0.3356577E 00
X(4)= 0.2661108E-03
X(1)= 0.7593717E-02
X(2)=-0.2694553E 01
X(3)= 0.3356643E 00
X(4)= 0.2655464E-03

ITERATION NO.= 7

X(1)= 0.7593717E-02
X(2)=-0.2694553E 01
X(3)= 0.3356643E 00
X(4)= 0.2655464E-03
X(1)= 0.7593028E-02
X(2)=-0.2695400E 01
X(3)= 0.3356613E 00
X(4)= 0.2657797E-03

ITERATION NO.= 8

X(1)= 0.7593028E-02
X(2)=-0.2695400E 01
X(3)= 0.3356613E 00
X(4)= 0.2657797E-03
X(1)= 0.7593293E-02
X(2)=-0.2695047E 01
X(3)= 0.3356625E 00
X(4)= 0.2656851E-03

ITERATION NO.= 9

X(1)= 0.7593293E-02
X(2)=-0.2695047E 01
X(3)= 0.3356625E 00
X(4)= 0.2656851E-03
X(1)= 0.7593185E-02
X(2)=-0.2695190E 01
X(3)= 0.3356619E 00
X(4)= 0.2657329E-03

F(1)= 0.1192093E-06
F(2)= 0.1370907E-05
F(3)= -0.1289248E-03
F(4)= -0.1907349E-05

P(1,1)= 0.1142025E-02
P(1,2)= -0.5022161E-02
P(1,3)= -0.2917199E-01
P(1,4)= 0.0
P(2,1)= 0.2303421E 02
P(2,2)= -0.1970594E-02
P(2,3)= 0.3551464E-01
P(2,4)= 0.7268225E 02
P(3,1)= 0.0
P(3,2)= 0.8892462E 00

P(3,3)= 0.1311198E 01
P(3,4)=-0.1000000E 01
P(4,1)=-0.1835823E 02
P(4,2)=-0.2477034E-02
P(4,3)= 0.6392634E 01
P(4,4)= 0.0

SXSI(1)= 0.7593185E-02
SXSI(2)=-0.2695190E 01
SXSI(3)= 0.3356619E 00
SXSI(4)= 0.2657329E-03

-----CIPCM(4)= 0.6217436E-01

CLIFT= 0.2955419E 00 CDAG= 0.7918984E-01 CMOMENT=-0.2297443E 00 L/D= 0.3732065E 01

-----LIFT DRAG COEFFTS BASED ON U1-----CLD= 0.3336667E 00 CDD= 0.8940530E-01

RCP= 0.3362200E 00

RCP= 0.3379090E 00

RCP= 0.3407494E 00

RCP= 0.3447824E 00

AG(1)= 0.1132367E 00

AG(2)= 0.4418985E-07

AG(3)= 0.5153619E-02

AG(4)= 0.1560457E-07

AG(5)= 0.1182862E-02

AG(6)= 0.1695681E-07

AG(7)= 0.1659336E-02

TGA= 0.1778718E 00 CL3D= 0.3557435E 00

CIRCD(1)= 0.1765881E 00

CIRCD(2)= 0.1026369E 00

CIRCD(3)= 0.8090723E-01

CIRCD(4)= 0.6220964E-01

---PSSC(1)= 0.2510905E 01

---PSSC(2)= 0.2543260E 01

---PSSC(3)= 0.2495591E 01

---PSSC(4)= 0.2525798E 01

DOWN WASH ANGLE IN DEGREE= 0.2623338E 01

-----POSITION CP SPAN----- 1 NO. OF ITER.= 1

BIGS= 0.2285714E 01 ISPAN= 1 AR= 0.4000000E 01

PSIZ= 0.2510905E 01

ITERATION NO.= 1

X(1)= 0.9203110E-02

X(2)=-0.2808448E 01

X(3)= 0.2467658E 00

X(4)= 0.7488482E-05

X(1)= 0.9203110E-02

X(2)=-0.2808448E 01

X(3)= 0.2467658E 00

X(4)= 0.7488482E-05

X(1)= 0.9226087E-02

X(2)=-0.2809398E 01

X(3)= 0.2466132E 00

X(4)= 0.7371247E-05

ITERATION NO.= 1

X(1)= 0.9226087E-02

X(2)=-0.2809398E 01

X(3)= 0.2466132E 00

X(4)= 0.7371247E-05

X(1)= 0.9223953E-02

X(2)=-0.2811986E 01

X(3)= 0.2466093E 00

X(4)= 0.7346679E-05

ITERATION NO.= 2

X(1)= 0.9223953E-02

X(2)=-0.2811986E 01

X(3)= 0.2466093E-00
X(4)= 0.7346675E-05
X(1)= 0.9223241E-02
X(2)= -0.2812836E-01
X(3)= 0.2466074E-00
X(4)= 0.7351538E-05

ITERATION NO.= 3

X(1)= 0.9223241E-02
X(2)= -0.2812836E-01
X(3)= 0.2466074E-00
X(4)= 0.7351538E-05
X(1)= 0.9223431E-02
X(2)= -0.2812638E-01
X(3)= 0.2466078E-00
X(4)= 0.7349685E-05

ITERATION NO.= 4

X(1)= 0.9223431E-02
X(2)= -0.2812638E-01
X(3)= 0.2466078E-00
X(4)= 0.7349685E-05
X(1)= 0.9223383E-02
X(2)= -0.2812709E-01
X(3)= 0.2466078E-00
X(4)= 0.7350002E-05
F(1)= 0.1192093E-06
F(2)= -0.1789139E-06
F(3)= -0.6544590E-04
F(4)= 0.1907349E-05
P(1,1)= 0.1032949E-02
P(1,2)= -0.8538317E-02
P(1,3)= -0.3549808E-01
P(1,4)= 0.0
P(2,1)= 0.2371669E-02
P(2,2)= -0.1518257E-02
P(2,3)= -0.4837965E-01
P(2,4)= 0.2627405E-04
P(3,1)= 0.0
P(3,2)= 0.9193894E-00
P(3,3)= 0.1598735E-01
P(3,4)= -0.1000000E-01
P(4,1)= -0.2727509E-02
P(4,2)= -0.3729744E-02
P(4,3)= 0.1295533E-02
P(4,4)= 0.0

SXSI(1)= 0.9223383E-02
SXSI(2)= -0.2812709E-01
SXSI(3)= 0.2466078E-00
SXSI(4)= 0.7350002E-05

-----CIPCN(1)= 0.1065493E-00

CLIFT= 0.3284220E-00 CDRA= 0.8799994E-01 CMOMENT=-0.6237481E-00 L/D= 0.3732070E-01

-----LIFT DRAG COEFFTS BASED ON U1-----CLD= 0.3707883E-00 CDD= 0.9935188E-01

UPPER CAVITY SHAPE

LOWER CAVITY SHAPE

ISJ	XXU	YYU	XXL	YYL
1	0.0	0.0	0.0	0.0
3	-0.2522762E-03	0.7310498E-03	0.5929726E-01	-0.1119248E-01
5	-0.1364364E-03	0.1811706E-02	0.1472265E-00	-0.2848272E-01
7	0.3725775E-03	0.3164061E-02	0.2361675E-00	-0.4341830E-01
9	0.1279542E-02	0.4738893E-02	0.3258732E-00	-0.5698293E-01
11	0.2595019E-02	0.6510071E-02	0.4162398E-00	-0.6955123E-01
13	0.4332889E-02	0.8461719E-02	0.5072033E-00	-0.8132011E-01
15	0.6509498E-02	0.1058362E-01	0.5987166E-00	-0.9241235E-01
17	0.9143360E-02	0.1286917E-01	0.6907420E-00	-0.1029121E-00
19	0.1225505E-01	0.1531424E-01	0.7832475E-00	-0.1128819E-00

ISJ= 21	XXU= 0.1586717E-01	YYU= 0.1791652E-01	XXL= 0.8762055E 00	YYL=-0.1223699E 00
ISJ= 23	XXU= 0.2001450E-01	YYU= 0.2167517E-01	XXL= 0.9695914E 00	YYL=-0.1314147E 00
ISJ= 25	XXU= 0.2469442E-01	YYU= 0.2359058E-01	XXL= 0.1063383E 01	YYL=-0.1400472E 00
ISJ= 27	XXU= 0.2996635E-01	YYU= 0.2566418E-01	XXL= 0.1157560E 01	YYL=-0.1482940E 00
ISJ= 29	XXU= 0.3585284E-01	YYU= 0.2989837E-01	XXL= 0.1252105E 01	YYL=-0.1561770E 00
ISJ= 31	XXU= 0.4238939E-01	YYU= 0.3329648E-01	XXL= 0.1347000E 01	YYL=-0.1637154E 00
ISJ= 33	XXU= 0.4961494E-01	YYU= 0.3686272E-01	XXL= 0.1442230E 01	YYL=-0.1709250E 00
ISJ= 35	XXU= 0.5757225E-01	YYU= 0.4060220E-01	XXL= 0.1537781E 01	YYL=-0.1778203E 00
ISJ= 37	XXU= 0.6637838E-01	YYU= 0.4452099E-01	XXL= 0.1637638E 01	YYL=-0.1844140E 00
ISJ= 39	XXU= 0.7587534E-01	YYU= 0.4862614E-01	XXL= 0.1729790E 01	YYL=-0.1907167E 00
ISJ= 41	XXU= 0.8633759E-01	YYU= 0.5292577E-01	XXL= 0.1826223E 01	YYL=-0.1967380E 00
ISJ= 43	XXU= 0.9773803E-01	YYU= 0.5742915E-01	XXL= 0.1922929E 01	YYL=-0.2024859E 00
ISJ= 45	XXU= 0.1101689E 00	YYU= 0.6214687E-01	XXL= 0.2019896E 01	YYL=-0.2079679E 00
ISJ= 47	XXU= 0.1237028E 00	YYU= 0.6709093E-01	XXL= 0.2117113E 01	YYL=-0.2131903E 00
ISJ= 49	XXU= 0.1384291E 00	YYU= 0.7227504E-01	XXL= 0.2214573E 01	YYL=-0.2181583E 00
ISJ= 51	XXU= 0.1544489E 00	YYU= 0.7771490E-01	XXL= 0.2312266E 01	YYL=-0.2228768E 00
ISJ= 53	XXU= 0.1718765E 00	YYU= 0.8342797E-01	XXL= 0.2410185E 01	YYL=-0.2273496E 00
ISJ= 55	XXU= 0.1908425E 00	YYU= 0.8943493E-01	XXL= 0.2508321E 01	YYL=-0.2315795E 00
ISJ= 57	XXU= 0.2114965E 00	YYU= 0.9575868E-01	XXL= 0.2606667E 01	YYL=-0.2355695E 00
ISJ= 59	XXU= 0.2340114E 00	YYU= 0.1024266E 00	XXL= 0.2705215E 01	YYL=-0.2393206E 00
ISJ= 61	XXU= 0.2585878E 00	YYU= 0.1094697E 00	XXL= 0.2803960E 01	YYL=-0.2428340E 00
ISJ= 63	XXU= 0.2854614E 00	YYU= 0.1169245E 00	XXL= 0.2902894E 01	YYL=-0.2461097E 00
ISJ= 65	XXU= 0.3149103E 00	YYU= 0.1248339E 00	XXL= 0.3002012E 01	YYL=-0.2491471E 00
ISJ= 67	XXU= 0.3472668E 00	YYU= 0.1332490E 00	XXL= 0.3101308E 01	YYL=-0.2519450E 00
ISJ= 69	XXU= 0.3829321E 00	YYU= 0.1422310E 00	XXL= 0.3200776E 01	YYL=-0.2545007E 00
ISJ= 71	XXU= 0.4223969E 00	YYU= 0.1518540E 00	XXL= 0.3300411E 01	YYL=-0.2568106E 00
ISJ= 73	XXU= 0.4662696E 00	YYU= 0.1622092E 00	XXL= 0.3400208E 01	YYL=-0.2588705E 00
ISJ= 75	XXU= 0.5153180E 00	YYU= 0.1734105E 00	XXL= 0.3500161E 01	YYL=-0.2606741E 00
ISJ= 77	XXU= 0.5705299E 00	YYU= 0.1856930E 00	XXL= 0.3600266E 01	YYL=-0.2622138E 00
ISJ= 79	XXU= 0.6332061E 00	YYU= 0.1989748E 00	XXL= 0.3700520E 01	YYL=-0.2634799E 00
ISJ= 81	XXU= 0.7051080E 00	YYU= 0.2137773E 00	XXL= 0.3800916E 01	YYL=-0.2644604E 00
ISJ= 83	XXU= 0.7887053E 00	YYU= 0.2303572E 00	XXL= 0.3901450E 01	YYL=-0.2651402E 00
ISJ= 85	XXU= 0.8876147E 00	YYU= 0.2472121E 00	XXL= 0.4002118E 01	YYL=-0.2654997E 00
ISJ= 87	XXU= 0.1007744E 01	YYU= 0.2710966E 00	XXL= 0.4102916E 01	YYL=-0.2655137E 01
ISJ= 89	XXU= 0.1157573E 01	YYU= 0.2972400E 00	XXL= 0.4203838E 01	YYL=-0.2651454E 00
ISJ= 91	XXU= 0.1355594E 01	YYU= 0.3298671E 00	XXL= 0.4304881E 01	YYL=-0.2643613E 00
ISJ= 93	XXU= 0.1640946E 01	YYU= 0.3737414E 00	XXL= 0.4406038E 01	YYL=-0.2630851E 00
ISJ= 95	XXU= 0.2139613E 01	YYU= 0.4429747E 00	XXL= 0.4507303E 01	YYL=-0.2612215E 00
ISJ= 97	XXU= 0.1553769E 02	YYU= 0.1028749E 01	XXL= 0.4608665E 01	YYL=-0.2586012E 00
ISJ= 99	XXU= 0.1589395E 02	YYU= 0.1140385E 01	XXL= 0.4710101E 01	YYL=-0.2548651E 00
ISJ= 101	XXU= 0.1659708E 02	YYU= 0.1053673E 01	XXL= 0.4811298E 01	YYL=-0.2470574E 00

UPPER WAKE SHAPE IS-----

XW(1)= 0.1659708E 02	YW(1)= 0.1053673E 01
XW(3)= 0.1546999E 02	YW(3)= 0.9066797E 00
XW(5)= 0.1364364E-03	YW(5)= 0.1811706E-02

FREE SURFACE SHAPE-----

RCP= 0.2470178E 00
RCP= 0.2482588E 00
RCP= 0.2503456E 00
RCP= 0.2533085E 00
RCP= 0.2571506E 00
RCP= 0.2620499E 00
RCP= 0.2579511E 00
AG(1)= 0.1120791E 00
AG(2)= 0.4361599E-07
AG(3)= 0.5049247E-02
AG(4)= 0.1861596E-07
AG(5)= 0.1133239E-02
AG(6)= 0.1916198E-07
AG(7)= 0.1575106E-02
TGA= 0.1760535E 00 CL30= 0.3521069E 00
DOWN WASH ANGLE IN DEGREE= 0.3279706E 01

-----POSITION OF SPAN----- 2 NO. OF ITER.= 1

BIGS= 0.2285714E 01 ISPAN= 2 AR= 0.4000000E 01

PSIZ= 0.2543260E 01

ITERATION NO.= 1

X(1)= 0.8218285E-02

X(2)= -0.2643957E 01

X(3)= 0.2469316E 00

X(4)= 0.1426347E-04

X(1)= 0.8218285E-02

X(2)= -0.2643957E 01

X(3)= 0.2469316E 00

X(4)= 0.1426347E-04

X(1)= 0.8285973E-02

X(2)= -0.2645251E 01

X(3)= 0.2468992E 00

X(4)= 0.1356554E-04

ITERATION NO.= 1

X(1)= 0.8285973E-02

X(2)= -0.2645251E 01

X(3)= 0.2468992E 00

X(4)= 0.1356554E-04

X(1)= 0.8275021E-02

X(2)= -0.2658412E 01

X(3)= 0.2468676E 00

X(4)= 0.1374490E-04

ITERATION NO.= 2

X(1)= 0.8275021E-02

X(2)= -0.2658412E 01

X(3)= 0.2468676E 00

X(4)= 0.1374490E-04

X(1)= 0.8278329E-02

X(2)= -0.2654561E 01

X(3)= 0.2468774E 00

X(4)= 0.1367738E-04

ITERATION NO.= 3

X(1)= 0.8278329E-02

X(2)= -0.2654561E 01

X(3)= 0.2468774E 00

X(4)= 0.1367738E-04

X(1)= 0.8277114E-02

X(2)= -0.2655984E 01

X(3)= 0.2468743E 00

X(4)= 0.1370163E-04

ITERATION NO.= 4

X(1)= 0.8277114E-02

X(2)= -0.2655984E 01

X(3)= 0.2468743E 00

X(4)= 0.1370163E-04

X(1)= 0.8277554E-02

X(2)= -0.2655476E 01

X(3)= 0.2468754E 00

X(4)= 0.1369330E-04

ITERATION NO.= 5

X(1)= 0.8277554E-02

X(2)= -0.2655476E 01

X(3)= 0.2468754E 00

X(4)= 0.1369330E-04

X(1)= 0.8277409E-02

X(2)= -0.2655651E 01

X(3)= 0.2468749E 00

X(4)= 0.1369600E-04

F(1)= 0.5960464E-07

F(2)= 0.5354418E-06
 F(3)= -0.1616478E-03
 F(4)= -0.9536743E-06
 P(1,1)= 0.1094938E 02
 P(1,2)= -0.9195752E-02
 P(1,3)= -0.3540390E-01
 P(1,4)= 0.0
 P(2,1)= 0.2500415E 02
 P(2,2)= -0.1728149E-02
 P(2,3)= -0.4828725E-01
 P(2,4)= 0.1410222E 04
 P(3,1)= 0.0
 P(3,2)= 0.9149395E 00
 P(3,3)= 0.1549452E 01
 P(3,4)= -0.1000000E 01
 P(4,1)= -0.2865791E 02
 P(4,2)= -0.3770919E-02
 P(4,3)= 0.1255468E 02
 P(4,4)= 0.0

SXSI(1)= 0.8277409E-02
 SXSI(2)= -0.2655651E 01
 SXSI(3)= 0.2468749E 00
 SXSI(4)= 0.1369600E-04

-----CIPCN(2)= 0.1027434E 00

CLIFT= 0.3155915E 00 CDKAG= 0.8456212E-01 CMCMET=-0.5974817E 00 L/D= 0.3732065E 01

-----LIFT DRAG COEFFTS BASED ON U1-----CLD= 0.3563027E 00 CDD= 0.5547061E-01

UPPER CAVITY SHAPE

LOWER CAVITY SHAPE

ISJ=	1 XXU= 0.0	YYU= 0.0	XXL= 0.0	YYL= 0.0
ISJ= 3	XXU=-0.2097530E-03	YYU= 0.6908395E-03	XXL= 0.5265077E-01	YYL=-0.1679438E-01
ISJ= 5	XXU=-0.5197826E-04	YYU= 0.1718431E-02	XXL= 0.1339157E 00	YYL=-0.3227679E-01
ISJ= 7	XXU= 0.5004182E-03	YYU= 0.3707331E-02	XXL= 0.2167551E 00	YYL=-0.4561729E-01
ISJ= 9	XXU= 0.1453409E-02	YYU= 0.4510004E-02	XXL= 0.2988516E 00	YYL=-0.5772734E-01
ISJ= 11	XXU= 0.2818358E-02	YYU= 0.6201196E-02	XXL= 0.3822165E 00	YYL=-0.6895047E-01
ISJ= 13	XXU= 0.4609775E-02	YYU= 0.8765537E-02	XXL= 0.4660558E 00	YYL=-0.7946545E-01
ISJ= 15	XXU= 0.6894565E-02	YYU= 0.1009312E-01	XXL= 0.5504597E 00	YYL=-0.8938235E-01
ISJ= 17	XXU= 0.9541745E-02	YYU= 0.1227750E-01	XXL= 0.6352499E 00	YYL=-0.9877712E-01
ISJ= 19	XXU= 0.1272236E-01	YYU= 0.1461460E-01	XXL= 0.7204673E 00	YYL=-0.1077043E 00
ISJ= 21	XXU= 0.1640955E-01	YYU= 0.1710214E-01	XXL= 0.8069799E 00	YYL=-0.1162065E 00
ISJ= 23	XXU= 0.2062862E-01	YYU= 0.1973920E-01	XXL= 0.8920676E 00	YYL=-0.1243170E 00
ISJ= 25	XXU= 0.2540723E-01	YYU= 0.2252606E-01	XXL= 0.9784121E 00	YYL=-0.1320639E 00
ISJ= 27	XXU= 0.3077557E-01	YYU= 0.2546398E-01	XXL= 0.1065096E 01	YYL=-0.1394693E 00
ISJ= 29	XXU= 0.3676666E-01	YYU= 0.2855517E-01	XXL= 0.1152105E 01	YYL=-0.1465524E 00
ISJ= 31	XXU= 0.4341660E-01	YYU= 0.3187268E-01	XXL= 0.1239426E 01	YYL=-0.1533298E 00
ISJ= 33	XXU= 0.5076497E-01	YYU= 0.3521045E-01	XXL= 0.1327044E 01	YYL=-0.1598157E 00
ISJ= 35	XXU= 0.5885522E-01	YYU= 0.3879326E-01	XXL= 0.1414947E 01	YYL=-0.1660224E 00
ISJ= 37	XXU= 0.6773514E-01	YYU= 0.4252675E-01	XXL= 0.1503124E 01	YYL=-0.1719604E 00
ISJ= 39	XXU= 0.7745755E-01	YYU= 0.4644753E-01	XXL= 0.1591565E 01	YYL=-0.1776389E 00
ISJ= 41	XXU= 0.8808082E-01	YYU= 0.5055321E-01	XXL= 0.1680260E 01	YYL=-0.1830662E 00
ISJ= 43	XXU= 0.9936987E-01	YYU= 0.5485247E-01	XXL= 0.1769198E 01	YYL=-0.1882493E 00
ISJ= 45	XXU= 0.1122969E 00	YYU= 0.5935526E-01	XXL= 0.1858373E 01	YYL=-0.1931947E 00
ISJ= 47	XXU= 0.1260426E 00	YYU= 0.6407285E-01	XXL= 0.1947774E 01	YYL=-0.1979074E 00
ISJ= 49	XXU= 0.1479984E 00	YYU= 0.6971877E-01	XXL= 0.2037395E 01	YYL=-0.2023922E 00
ISJ= 51	XXU= 0.1572660E 00	YYU= 0.7429552E-01	XXL= 0.2127227E 01	YYL=-0.2066526E 00
ISJ= 53	XXU= 0.1749619E 00	YYU= 0.7965183E-01	XXL= 0.2217263E 01	YYL=-0.2106922E 00
ISJ= 55	XXU= 0.1942186E 00	YYU= 0.8537639E-01	XXL= 0.2307498E 01	YYL=-0.2145134E 00
ISJ= 57	XXU= 0.2151876E 00	YYU= 0.9140015E-01	XXL= 0.2397923E 01	YYL=-0.2181181E 00
ISJ= 59	XXU= 0.2380450E 00	YYU= 0.9774923E-01	XXL= 0.2488534E 01	YYL=-0.2215074E 00
ISJ= 61	XXU= 0.2629939E 00	YYU= 0.1044527E 00	XXL= 0.2579324E 01	YYL=-0.2246822E 00
ISJ= 63	XXU= 0.2902735E 00	YYU= 0.1115445E 00	XXL= 0.2670288E 01	YYL=-0.2276419E 00
ISJ= 65	XXU= 0.3201661E 00	YYU= 0.1190650E 00	XXL= 0.2761420E 01	YYL=-0.2303862E 00
ISJ= 67	XXU= 0.3537085E 00	YYU= 0.1270618E 00	XXL= 0.2852716E 01	YYL=-0.2329131E 00
ISJ= 69	XXU= 0.3892089E 00	YYU= 0.1355920E 00	XXL= 0.2944171E 01	YYL=-0.2352205E 00

ISJ= 71 XXU= 0.4292640E 00	YYU= 0.1447250E 00	XXL= 0.3035779E 01	YYL=-0.2373051E 00
ISJ= 73 XXU= 0.4737916E 00	YYU= 0.1545456E 00	XXL= 0.3127537E 01	YYL=-0.2391622E 00
ISJ= 75 XXU= 0.5235707E 00	YYU= 0.1651601E 00	XXL= 0.3219440E 01	YYL=-0.2407863E 00
ISJ= 77 XXU= 0.5796034E 00	YYU= 0.1767034E 00	XXL= 0.3311482E 01	YYL=-0.2421700E 00
ISJ= 79 XXU= 0.6432094E 00	YYU= 0.1973504E 00	XXL= 0.3403662E 01	YYL=-0.2433046E 00
ISJ= 81 XXU= 0.7161760E 00	YYU= 0.2033346E 00	XXL= 0.3495974E 01	YYL=-0.2441788E 00
ISJ= 83 XXU= 0.8010085E 00	YYU= 0.2189771E 00	XXL= 0.3588414E 01	YYL=-0.2447783E 00
ISJ= 85 XXU= 0.9013761E 00	YYU= 0.2367386E 00	XXL= 0.3680580E 01	YYL=-0.2450854E 00
ISJ= 87 XXU= 0.1022964E 01	YYU= 0.2573153E 00	XXL= 0.3773665E 01	YYL=-0.2450767E 00
ISJ= 89 XXU= 0.1175296E 01	YYU= 0.2818392E 00	XXL= 0.3866467E 01	YYL=-0.2447217E 00
ISJ= 91 XXU= 0.1376209E 01	YYU= 0.3123515E 00	XXL= 0.3959382E 01	YYL=-0.2439787E 00
ISJ= 93 XXU= 0.1665711E 01	YYU= 0.3532000E 00	XXL= 0.4052403E 01	YYL=-0.2427882E 00
ISJ= 95 XXU= 0.2171568E 01	YYU= 0.4171570E 00	XXL= 0.4145525E 01	YYL=-0.2410592E 00
ISJ= 97 XXU= 0.1578254E 02	YYU= 0.8486975E 00	XXL= 0.4238737E 01	YYL=-0.2386356E 00
ISJ= 99 XXU= 0.1614488E 02	YYU= 0.8561823E 00	XXL= 0.432021E 01	YYL=-0.2351870E 00
ISJ=101 XXU= 0.1686392E 02	YYU= 0.8610507E 00	XXL= 0.4425087E 01	YYL=-0.2280018E 00

UPPER WAKE SHAPE IS-----

XW(1)= 0.1686392E 02	YW(1)= 0.8610507E 00
XW(3)= 0.1572097E 02	YW(3)= 0.7228082E 00
XW(5)= -0.5197828E -04	YW(5)= 0.1718431E -02

FREE SURFACE SHAPE-----

RCP= 0.2472854E 00
RCP= 0.2485278E -00
RCP= 0.2506167E 00
RCP= 0.2535828E 00
RCP= 0.2574692E 00
RCP= 0.2623338E 00

AG(1)= 0.1120791E 00
AG(2)= 0.4361599E -07
AG(3)= 0.5049247E -02
AG(4)= 0.1861596E -07
AG(5)= 0.1133239E -02
AG(6)= 0.1916196E -07
AG(7)= 0.1575106E -02

TGA= 0.1760535E -00 CL30= 0.3521069E 00

DOWN WASH ANGLE IN DEGREE= 0.3166588E 01

-----POSITION OF SPAN----- 3 NO. OF ITER.= 1

RIGS= 0.1812326E 01 ISPAN= 3 AR= 0.4000000E 01

PSIZ= 0.2495591E 01

ITERATION NO.= 1

X(1)= 0.8459248E -02
X(2)= -0.2777954E 01
X(3)= 0.2887270E 00
X(4)= 0.4957775E -04
X(1)= 0.8459248E -02
X(2)= -0.2777954E 01
X(3)= 0.2887270E 00
X(4)= 0.4957775E -04
X(1)= 0.8487396E -02
X(2)= -0.2778960E 01
X(3)= 0.2885041E 00
X(4)= 0.4870044E -04

ITERATION NO.= 1

X(1)= 0.8487396E -02
X(2)= -0.2778960E 01
X(3)= 0.2886041E 00
X(4)= 0.4870044E -04
X(1)= 0.8483719E -02
X(2)= -0.2783510E 01
X(3)= 0.2885937E 00
X(4)= 0.4873036E -04

ITERATION NO.= 2

X(1)= 0.8483719E-02
 X(2)=-0.2783510E 01
 X(3)= 0.2885937E 00
 X(4)= 0.4873036E-04
 X(1)= 0.8483913E-02
 X(2)=-0.2783218E 01
 X(3)= 0.2885939E 00
 X(4)= 0.4870558E-04

ITERATION NO.= 3

X(1)= 0.8483913E-02
 X(2)=-0.2783218E 01
 X(3)= 0.2885939E 00
 X(4)= 0.4870558E-04
 X(1)= 0.8483794E-02
 X(2)=-0.2783382E 01
 X(3)= 0.2895934E 00
 X(4)= 0.4871104E-04

F(1)= 0.1788139E-06
 F(2)=-0.2384186E-06
 F(3)=-0.1496673E-03
 F(4)=-0.1907349E-05

P(1,1)= 0.1080335E 02
 P(1,2)=-0.8654833E-02
 P(1,3)=-0.3214204E-01
 P(1,4)= 0.0

P(2,1)= 0.2318323E 02
 P(2,2)=-0.1692713E-02
 P(2,3)=-0.4130694E-01
 P(2,4)= 0.3964761E-03

P(3,1)= 0.0
 P(3,2)= 0.2060509E 00
 P(3,3)= 0.1458950E 01
 P(3,4)=-0.1000000E 01

P(4,1)=-0.2202988E 02
 P(4,2)=-0.2741215E-02
 P(4,3)= 0.8757072E 01
 P(4,4)= 0.0

SXSI(1)= 0.8483794E-02
 SXSI(2)=-0.2783382E 01
 SXSI(3)= 0.2885934E 00
 SXSI(4)= 0.4871104E-04

-----CIRCH(3)= 0.8089131E-01

CLIFT= 0.3130823E 00 CDRA= 0.8388966E-01 CMOMENT=-0.3724415E 00 L/O= 0.3732072E 01

-----LIFT DRAG COEFFTS BASED ON U1-----CLD= 0.3534698E 00 CDD= 0.9471136E-01

UPPER CAVITY SHAPE

LOWER CAVITY SHAPE

ISJ=	1	XXU= 0.0	YYU= 0.0	XXL= 0.0	YYL= 0.0
ISJ= 3	XXU=-0.1493716E-03	YYU= 0.6266977E-03	XXL= 0.4627565E-01	YYL=-0.1337132E-01	
ISJ= 5	XXU= 0.5041334E-04	YYU= 0.1559494E-02	XXL= 0.1175447E 00	YYL=-0.2680396E-01	
ISJ= 7	XXU= 0.6564429E-03	YYU= 0.2728109E-02	XXL= 0.1896594E 00	YYL=-0.3840537E-01	
ISJ= 9	XXU= 0.1645167E-02	YYU= 0.4089666E-02	XXL= 0.2624310E 00	YYL=-0.4894591E-01	
ISJ= 11	XXU= 0.3037770E-02	YYU= 0.5617805E-02	XXL= 0.3357788E 00	YYL=-0.5871640E-01	
ISJ= 13	XXU= 0.4849740E-02	YYU= 0.7301245E-02	XXL= 0.4096518E 00	YYL=-0.6786966E-01	
ISJ= 15	XXU= 0.7095687E-02	YYU= 0.9129707E-02	XXL= 0.4840119E 00	YYL=-0.7649940E-01	
ISJ= 17	XXU= 0.9796530E-02	YYU= 0.1109707E-01	XXL= 0.5588284E 00	YYL=-0.8467144E-01	
ISJ= 19	XXU= 0.1297240E-01	YYU= 0.1319940E-01	XXL= 0.6340744E 00	YYL=-0.9243351E-01	
ISJ= 21	XXU= 0.1654614E-01	YYU= 0.1543433E-01	XXL= 0.7097272E 00	YYL=-0.9982181E-01	
ISJ= 23	XXU= 0.2084273E-01	YYU= 0.1780079E-01	XXL= 0.7857656E 00	YYL=-0.1068664E 00	
ISJ= 25	XXU= 0.2558945E-01	YYU= 0.2129873E-01	XXL= 0.8621711E 00	YYL=-0.1135909E 00	
ISJ= 27	XXU= 0.3091608E-01	YYU= 0.2292909E-01	XXL= 0.9349264E 00	YYL=-0.1200151E 00	
ISJ= 29	XXU= 0.3685514E-01	YYU= 0.2569329E-01	XXL= 0.1016015E 01	YYL=-0.1261557E 00	
ISJ= 31	XXU= 0.4344222E-01	YYU= 0.2959403E-01	XXL= 0.1093423E 01	YYL=-0.1320273E 00	
ISJ= 33	XXU= 0.5071630E-01	YYU= 0.3163440E-01	XXL= 0.1171137E 01	YYL=-0.1376423E 00	

ISJ= 35	XXU= 0.5872019E-01	YYU= 0.3481832E-01	XXL= 0.1249145E 01	YYL=-0.1430112E 00
ISJ= 37	XXU= 0.6750095E-01	YYU= 0.3815049E-01	XXL= 0.1327434E 01	YYL=-0.1481431E 00
ISJ= 39	XXU= 0.7711059E-01	YYU= 0.4163638E-01	XXL= 0.1405593E 01	YYL=-0.1530465E 00
ISJ= 41	XXU= 0.8760661E-01	YYU= 0.4528235E-01	XXL= 0.1494812E 01	YYL=-0.1577284E 00
ISJ= 43	XXU= 0.9905285E-01	YYU= 0.4909567E-01	XXL= 0.1563881E 01	YYL=-0.1621950E 00
ISJ= 45	XXU= 0.1115205E 00	YYU= 0.5308465E-01	XXL= 0.1643191E 01	YYL=-0.1664516E 00
ISJ= 47	XXU= 0.1250890E 00	YYU= 0.5725876E-01	XXL= 0.1722734E 01	YYL=-0.1705028E 00
ISJ= 49	XXU= 0.1398479E 00	YYU= 0.6162875E-01	XXL= 0.1802502E 01	YYL=-0.1743528E 00
ISJ= 51	XXU= 0.1558980E 00	YYU= 0.6620687E-01	XXL= 0.1882484E 01	YYL=-0.1780049E 00
ISJ= 53	XXU= 0.1733530E 00	YYU= 0.7100707E-01	XXL= 0.1962677E 01	YYL=-0.1814617E 00
ISJ= 55	XXU= 0.1923451E 00	YYU= 0.7604539E-01	XXL= 0.2043071E 01	YYL=-0.1847252E 00
ISJ= 57	XXU= 0.2130219E 00	YYU= 0.8134013E-01	XXL= 0.2123660E 01	YYL=-0.1877972E 00
ISJ= 59	XXU= 0.2355567E 00	YYU= 0.8691239E-01	XXL= 0.2204438E 01	YYL=-0.1906787E 00
ISJ= 61	XXU= 0.2601499E 00	YYU= 0.9278673E-01	XXL= 0.2285399E 01	YYL=-0.1933700E 00
ISJ= 63	XXU= 0.2870367E 00	YYU= 0.9899163E-01	XXL= 0.2366538E 01	YYL=-0.1958711E 00
ISJ= 65	XXU= 0.3154949E 00	YYU= 0.1055607E 00	XXL= 0.2447848E 01	YYL=-0.1981812E 00
ISJ= 67	XXU= 0.3488563E 00	YYU= 0.1125336E 00	XXL= 0.2529325E 01	YYL=-0.2002987E 00
ISJ= 69	XXU= 0.3845214E 00	YYU= 0.1199579E 00	XXL= 0.2610962E 01	YYL=-0.2022213E 00
ISJ= 71	XXU= 0.4239801E 00	YYU= 0.1278912E 00	XXL= 0.2692757E 01	YYL=-0.2039462E 00
ISJ= 73	XXU= 0.4678397E 00	YYU= 0.1364040E 00	XXL= 0.2774703E 01	YYL=-0.2054691E 00
ISJ= 75	XXU= 0.5160668E 00	YYU= 0.1455841E 00	XXL= 0.2856796E 01	YYL=-0.2067848E 00
ISJ= 77	XXU= 0.5720472E 00	YYU= 0.1555429E 00	XXL= 0.2939033E 01	YYL=-0.2078871E 00
ISJ= 79	XXU= 0.6346793E 00	YYU= 0.1664243E 00	XXL= 0.3021408E 01	YYL=-0.2087676E 00
ISJ= 81	XXU= 0.7055209E 00	YYU= 0.1784201E 00	XXL= 0.3103918E 01	YYL=-0.2094163E 00
ISJ= 83	XXU= 0.7900366E 00	YYU= 0.1917925E 00	XXL= 0.3186559E 01	YYL=-0.2098204E 00
ISJ= 85	XXU= 0.8888355E 00	YYU= 0.2069168E 00	XXL= 0.3269325E 01	YYL=-0.2099640E 00
ISJ= 87	XXU= 0.1008510E 01	YYU= 0.2243567E 00	XXL= 0.3352215E 01	YYL=-0.2098261E 00
ISJ= 89	XXU= 0.1158423E 01	YYU= 0.2450227E 00	XXL= 0.3435223E 01	YYL=-0.2093791E 00
ISJ= 91	XXU= 0.1356117E 01	YYU= 0.2705433E 00	XXL= 0.3518344E 01	YYL=-0.2085859E 00
ISJ= 93	XXU= 0.1640924E 01	YYU= 0.3043445E 00	XXL= 0.3601574E 01	YYL=-0.2073929E 00
ISJ= 95	XXU= 0.2139423E 01	YYU= 0.3562745E 00	XXL= 0.3684907E 01	YYL=-0.2057186E 00
ISJ= 97	XXU= 0.1529549E 02	YYU= 0.4977713E 00	XXL= 0.3768333E 01	YYL=-0.2034233E 00
ISJ= 99	XXU= 0.1564314E 02	YYU= 0.4969754E 00	XXL= 0.3851834E 01	YYL=-0.2002110E 00
ISJ=101	XXU= 0.1631279E 02	YYU= 0.4979341E 00	XXL= 0.3935148E 01	YYL=-0.1936525E 00

UPPER MAKE SHAPE IS

XW(1)=	0.1631279E 02	YWL 1)=	0.4879341E 00
XW(3)=	0.1518905E 02	YWL 3)=	0.3719648E 00
XW(5)=	0.6041334E-04	YWL 5)=	0.1559494E-02

FREE SURFACE SHAPE

RCP=	0.2890732E 00
RCP=	0.2905255E 00
RCP=	0.2929674E 00
RCP=	0.2964348E 00
RCP=	0.3009779E 00
RCP=	0.3066645E 00
AG(1)=	0.1120791E 00
AG(2)=	0.4361599E-07
AG(3)=	0.5049247E-02
AG(4)=	0.1861596E-07
AG(5)=	0.1133239E-02
AG(6)=	0.1916196E-07
AG(7)=	0.1575106E-02

TGA= 0.1760535E 00 CL30= 0.3521069E 00

DOWN WASH ANGLE IN DEGREE= 0.3822908E 01

-----POSITION OF SPAN----- 4 NO. OF ITER.=1

RIGS= 0.1468048E 01 ISPAN= 4 AR= 0.4000000E 01

PSIZ= 0.2525798E 01

ITERATION NO.= 1

X(1)=	0.7593185E-02
X(2)=	-0.2695190E 01
X(3)=	0.3356619E 00
X(4)=	0.2657329E-03

X(1)= 0.7553185E-02
X(2)=-0.2695190E 01
X(3)= 0.3356619E 00
X(4)= 0.2657329E-03
X(1)= 0.7648766E-02
X(2)=-0.2696233E 01
X(3)= 0.3356259E 00
X(4)= 0.2569319E-03

ITERATION NO.= 1

X(1)= 0.7648766E-02
X(2)=-0.2696233E 01
X(3)= 0.3356259E 00
X(4)= 0.2569319E-03
X(1)= 0.7638961E-02
X(2)=-0.2708599E 01
X(3)= 0.3355879E 00
X(4)= 0.2595601E-03

ITERATION NO.= 2

X(1)= 0.7638961E-02
X(2)=-0.2708599E 01
X(3)= 0.3355879E 00
X(4)= 0.2595601E-03
X(1)= 0.7642299E-02
X(2)=-0.2704488E 01
X(3)= 0.3356017E 00
X(4)= 0.2584558E-03

ITERATION NO.= 3

X(1)= 0.7642299E-02
X(2)=-0.2704488E 01
X(3)= 0.3356017E 00
X(4)= 0.2584558E-03
X(1)= 0.7640913E-02
X(2)=-0.2706192E 01
X(3)= 0.3355960E 00
X(4)= 0.2589053E-03

ITERATION NO.= 4

X(1)= 0.7640913E-02
X(2)=-0.2706192E 01
X(3)= 0.3355960E 00
X(4)= 0.2589053E-03
X(1)= 0.7641423E-02
X(2)=-0.2705498E 01
X(3)= 0.3355978E 00
X(4)= 0.2587487E-03

ITERATION NO.= 5

X(1)= 0.7641423E-02
X(2)=-0.2705498E 01
X(3)= 0.3355978E 00
X(4)= 0.2587487E-03
X(1)= 0.7641241E-02
X(2)=-0.2705738E 01
X(3)= 0.3355973E 00
X(4)= 0.2588022E-03

ITERATION NO.= 6

X(1)= 0.7641241E-02
X(2)=-0.2705738E 01
X(3)= 0.3355973E 00
X(4)= 0.2588022E-03
X(1)= 0.7641379E-02
X(2)=-0.2705656E 01
X(3)= 0.3355976E 00
X(4)= 0.2587577E-03

F(1)= 0.9344650F-06
 F(2)= -0.2980232F-06
 F(3)= 0.7331371E-04
 F(4)= -0.9536743F-06
 P(1,1)= 0.1137257F-02
 P(1,2)= -0.8976031F-02
 P(1,3)= -0.2917764E-01
 P(1,4)= 0.0
 P(2,1)= 0.2293587E 02
 P(2,2)= -0.1953279F-02
 P(2,3)= -0.3552154F-01
 P(2,4)= 0.7461526E 02
 P(3,1)= 0.0
 P(3,2)= 0.8896546E 00
 P(3,3)= 0.1314485F 01
 P(3,4)= -0.1000000E 01
 P(4,1)= -0.1831055F-02
 P(4,2)= -0.2291015E-02
 P(4,3)= 0.6251791E 01
 P(4,4)= 0.0
 SXSI(1)= 0.7641379E-02
 SXSI(2)= -0.2705656E 01
 SXSI(3)= -0.3355976E 00
 SXSI(4)= 0.2587577E-03
 -----CIRCUM(4)= 0.6226581E-01
 CLIFT= 0.2962440E 00 CDORAG= 0.7937801E-01 CMOMENT= -0.2303241E 00 L/D= 0.3732065E 01
 -----LIFT DRAG COEFFTS BASED ON U1-----CLO= 0.3344594E 00 CDD= 0.8961773E-01
 UPPER CAVITY SHAPE LOWER CAVITY SHAPE
 ISJ= 1 XXU= 0.0 YYU= 0.0 XXL= 0.0 YYL= 0.0
 ISJ= 3 XXU= -0.6809358E-04 YYU= 0.5437022E-03 XXL= 0.3796023F-01 YYL= -0.1527474F-01
 ISJ= 5 XXU= 0.2201768E-03 YYU= 0.1357965E-02 XXL= 0.9533668E-01 YYL= -0.2558919E-01
 ISJ= 7 XXU= 0.3945127E-03 YYU= 0.2378551E-02 XXL= 0.1534044E 00 YYL= -0.3448987F-01
 ISJ= 9 XXU= 0.1962911E-02 YYU= 0.3567175E-02 XXL= 0.2120214E 00 YYL= -0.4257703F-01
 ISJ= 11 XXU= 0.3437940E-02 YYU= 0.4901510F-02 XXL= 0.2711264E 00 YYL= -0.5007675E-01
 ISJ= 13 XXU= 0.5334917E-02 YYU= 0.6369069E-02 XXL= 0.3206802E 00 YYL= -0.5710617F-01
 ISJ= 15 XXU= 0.7671345E-02 YYU= 0.7961255F-02 XXL= 0.3906532E 00 YYL= -0.6373769E-01
 ISJ= 17 XXU= 0.1046669E-01 YYU= 0.9672377E-02 XXL= 0.4510210E 00 YYL= -0.7002115E-01
 ISJ= 19 XXU= 0.1374235E-01 YYU= 0.1149865E-01 XXL= 0.5117624E 00 YYL= -0.7599229E-01
 ISJ= 21 XXU= 0.1752175E-01 YYU= 0.1343769E-01 XXL= 0.5728590E 00 YYL= -0.8167887E-01
 ISJ= 23 XXU= 0.2193045E-01 YYU= 0.1548821E-01 XXL= 0.6342540E 00 YYL= -0.8710295F-01
 ISJ= 25 XXU= 0.2669631E-01 YYU= 0.1764983E-01 XXL= 0.6960521F 00 YYL= -0.9228224E-01
 ISJ= 27 XXU= 0.3214965E-01 YYU= 0.1992295E-01 XXL= 0.7581192E 00 YYL= -0.9723157E-01
 ISJ= 29 XXU= 0.3822375E-01 YYU= 0.2230864E-01 XXL= 0.8204823F 00 YYL= -0.1019636E 00
 ISJ= 31 XXU= 0.4495472E-01 YYU= 0.2480862E-01 XXL= 0.8831293E 00 YYL= -0.1064886E 00
 ISJ= 33 XXU= 0.5238229E-01 YYU= 0.2742523E-01 XXL= 0.9460490E 00 YYL= -0.1108159F 00
 ISJ= 35 XXU= 0.6055900E-01 YYU= 0.3016143E-01 XXL= 0.1009231E 01 YYL= -0.1149535E 00
 ISJ= 37 XXU= 0.6950575E-01 YYU= 0.3302077E-01 XXL= 0.1072664F 01 YYL= -0.1189781E 00
 ISJ= 39 XXU= 0.7930237E-01 YYU= 0.3600747E-01 XXL= 0.1136341E 01 YYL= -0.1226854E 00
 ISJ= 41 XXU= 0.8999930E-01 YYU= 0.3912644E-01 XXL= 0.1200252E 01 YYL= -0.1262908E 00
 ISJ= 43 XXU= 0.1016580E 00 YYU= 0.4238331E-01 XXL= 0.1264388E 01 YYL= -0.1297288E 00
 ISJ= 45 XXU= 0.1143554E 00 YYU= 0.4578454E-01 XXL= 0.1328742E 01 YYL= -0.1330030E 00
 ISJ= 47 XXU= 0.1281695E 00 YYU= 0.4933751E-01 XXL= 0.1393307E 01 YYL= -0.1361170E 00
 ISJ= 49 XXU= 0.1431919E 00 YYU= 0.5330507E-01 XXL= 0.1458076F 01 YYL= -0.1390736E 00
 ISJ= 51 XXU= 0.1595250E 00 YYU= 0.5693329E-01 XXL= 0.1523041E 01 YYL= -0.1418747E 00
 ISJ= 53 XXU= 0.1772848E 00 YYU= 0.6099652E-01 XXL= 0.1588197E 01 YYL= -0.1445226E 00
 ISJ= 55 XXU= 0.1966039E 00 YYU= 0.6525266E-01 XXL= 0.1653537E 01 YYL= -0.1470187E 00
 ISJ= 57 XXU= 0.2176340E 00 YYU= 0.6971598E-01 XXL= 0.1719055F 01 YYL= -0.1493635E 00
 ISJ= 59 XXU= 0.2405502E 00 YYU= 0.7447281E-01 XXL= 0.1784747F 01 YYL= -0.1515580F 00
 ISJ= 61 XXU= 0.2655565E 00 YYU= 0.7933211E-01 XXL= 0.1850607E 01 YYL= -0.1536021E 00
 ISJ= 63 XXU= 0.2928913E 00 YYU= 0.8452594E-01 XXL= 0.1916630F 01 YYL= -0.1554952E 00
 ISJ= 65 XXU= 0.3228370E 00 YYU= 0.901075E-01 XXL= 0.1982810E 01 YYL= -0.1572367E 00
 ISJ= 67 XXU= 0.3557730E 00 YYU= 0.9581494E-01 XXL= 0.2049144E 01 YYL= -0.1588251E 00

IGA= 0.1778718E 00 CL3D= 0.3557435E 00

ISJ= 69 XXU= 0.3919781E 00	YYU= 0.1019771E 00	XXL= 0.2115626E 01	YYL=-0.1602581E 00
ISJ= 71 XXU= 0.4320775E 00	YYU= 0.1085401E 00	XXL= 0.2182254E 01	YYL=-0.1615332E 00
ISJ= 73 XXU= 0.4766451E 00	YYU= 0.1155576E 00	XXL= 0.2249022E 01	YYL=-0.1626469E 00
ISJ= 75 XXU= 0.5264592E 00	YYU= 0.1230558E 00	XXL= 0.2315927E 01	YYL=-0.1635948E 00
ISJ= 77 XXU= 0.5825205E 00	YYU= 0.1312384E 00	XXL= 0.2392564E 01	YYL=-0.1643713E 00
ISJ= 79 XXU= 0.6461470E 00	YYU= 0.1400928E 00	XXL= 0.2450130E 01	YYL=-0.1649656E 00
ISJ= 81 XXU= 0.7191232E 00	YYU= 0.1499010E 00	XXL= 0.2517422E 01	YYL=-0.1653814E 00
ISJ= 83 XXU= 0.8039507E 00	YYU= 0.1605558E 00	XXL= 0.2584835E 01	YYL=-0.1655959E 00
ISJ= 85 XXU= 0.9042921E 00	YYU= 0.1726373E 00	XXL= 0.2652367E 01	YYL=-0.1656001E 00
ISJ= 87 XXU= 0.1025824E 01	YYU= 0.1864297E 00	XXL= 0.2720013E 01	YYL=-0.1653765E 00
ISJ= 89 XXU= 0.1178749E 01	YYU= 0.2025991E 00	XXL= 0.2787769E 01	YYL=-0.1649027E 00
ISJ= 91 XXU= 0.1378770E 01	YYU= 0.2222684E 00	XXL= 0.2855633E 01	YYL=-0.1641480E 00
ISJ= 93 XXU= 0.1667903E 01	YYU= 0.2477432E 00	XXL= 0.2923599E 01	YYL=-0.1630687E 00
ISJ= 95 XXU= 0.2172910E 01	YYU= 0.2852830E 00	XXL= 0.2991662E 01	YYL=-0.1615977E 00
ISJ= 97 XXU= 0.1635760E 02	YYU=-0.2594590E-03	XXL= 0.3059814E 01	YYL=-0.1596209E 00
ISJ= 99 XXU= 0.1674242E 02	YYU=-0.1228690E-01	XXL= 0.3128040E 01	YYL=-0.1568962E 00
ISJ=101 XXU= 0.1757292E 02	YYU=-0.5147886E-01	XXL= 0.3196122E 01	YYL=-0.1514403E 00

UPPER WAKE SHAPE IS-----

XW(1)= 0.1757292E 02 YW(1)=-0.5140836E-01
XW(3)= 0.1643314E 02 YW(3)=-0.1422313E 00
XW(5)= 0.2201768E-03 YW(5)= 0.1357965E-02

FREE SURFACE SHAPE-----

RCP= 0.3361555E 00
RCP= 0.3378442E 00
RCP= 0.3406841E 00
RCP= 0.3447163E 00

AG(1)= 0.1120791E 00
AG(2)= 0.4361599E-07
AG(3)= 0.5749247E-02
AG(4)= 0.1361596E-07
AG(5)= 0.1133239E-02
AG(6)= 0.1916196E-07
AG(7)= 0.1575106E-02

TGA= 0.1760535E 00 CL3D= 0.3521069E 00

CIRCD(1)= 0.1055512E 00
CIRCD(2)= 0.1027381E 00
CIRCD(3)= 0.8089203E-01
CIRCD(4)= 0.6226370E-01

---PSSC(1)= 0.2509864E 01
---PSSC(2)= 0.2541763E 01
---PSSC(3)= 0.2494652E 01
---PSSC(4)= 0.2524677E 01

CD3D= 0.9350872E-01 CM3D=-0.2342469E 00

TGA= 0.1761501E 00 CL3D= 0.3523002E 00

5. Program Listing Output Example

```

// SET      TIME=5,REGION=192K,PRF=0,PUN=1000
// EXEC     PORTG
//DECK DD   SYSOUT=B,DCR=(RECFM=FBS,BLKSIZE=1680)
//COMP DD   *
C 3-D S/C HYDROFOIL UNDER FREE SURFACE.
C PROGRAMMED BY M. FURUYA 3/1/1974.
C THIS IS A PROGRAM IN WHICH OLD DATA SXSI(I,J) AND CIRCD(I)
C ARE READ FROM DATA CARDS. 7/4/1974.
C
  DIMENSION CMM(10),AGC(10)
  DIMENSION WXII(401),WYII(401),CIR(10),CIRI(10)
  DIMENSION AG(10),PGSD(10),CIRCI(20),BETAN(100)
  DIMENSION YBE(5),XZ(5),SXSID(5,20),CIRCEN(20),CCDD(10),AGD(10)
  DIMENSION SXSI(5),XXX(513),CP(513),INT(10),XCP(5),YCP(5)
  DIMENSION CDET(200),SIBET(200),XXU(101),YYU(101),XXL(101)
  DIMENSION YYL(101),AXU(101),AYU(101),AXL(101),AYL(101)
  DIMENSION FL(200),FD(200),FC(7),PIN(50,7),GIN(50,7)
  COMMON FLAPAN,CLD,CIRCD(20),HHH,ALFAZ,SIGMA,SBETA,XXM,ICPI
  COMMON IDUL,XA,XB,XC,TANG,EP,YC,YR,URIGS,XLBIGS,BIGS,SMALS,SSS
  COMMON XSN(5),CCC1,CLE,ERC,YYY,XM,ITERA,SXSIN(5),SXSIOO(5),YXS(5)
  COMMON PSIZ,LR,SARC(513),SARCO(513),LPM,DE,ISP,ASPI,III
  COMMON BETAN(513),BETAM(513),IJ,LPK,XII(200),XJJ(200),XOX
  COMMON AN(7),MPM,MPK,RZEROD(20),CIRCDI(20),NISP,NNISP
  COMMON IFLAG,SXX44
C PZERO IS IN EON. 14-3.
C X34LA IS A LIMITING VALUE FOR X(4)-X(3) TO BE COMBINED.
C NDIV IS USED FOR CALCULATION OF CAVITY SHAPE AS A LAST INCREMENT.
C NDIVL DENOTES NDIVISION OF LARGER INCREMENTS FOR CAVITY SHAPE CALC.
C NDIVL MUST BE ALWAYS AN EVEN NUMBER.
C NCAVIT IS A NUMBER OF INCREMENT ON CAVITY; ALWAYS MUST BE AN EVEN NUMBER.
  READ(5,1151) X34LA,NDIV,NDIVL,NCAVIT
  1151 FORMAT(E14.7,3I14)
  IFLAG=0
  READ(5,1100) NISP,NNISP
  1100 FORMAT(2I4)
C NISP=0 FOR THE CHANGE OF THE LAST CONTROL POINT OVER THE SPAN.
C NNISP=0 FOR THE INCREMENT OF THE POSITION OVER THE SPAN.
C SIGINC FOR THE INCREMENT OF SIGMA.
  IF(NISP,GE,1) GO TO 1110
  WRITE(6,1111) NNISP
  1111 FORMAT(20X,49H*****LAST CONTROL POINT ON SPAN IS*****PAI/8+PAI*,I2
  X,3H/64)
  1110 CONTINUE
C NCON IS USED FOR CONTROLLING THE NUMBER OF ITER. AT EACH POSITION.
  READ(5,201) NITER,NSTOP,MAXIT,NHK,KSTOP,NCON
  201 FORMAT(6I4)
  READ(5,202) ALFAZS, HHH,DE,SIGMS,SIGINC
  202 FORMAT(5E14.7)
C EPSO IS USED FOR CONTROLLING OF DIFFERENCE BETWEEN V(IN) & V(OUT).
C ----USUALLY EPSO=ASPI**2.-----
  READ(5,203) ADP, EPSO,XXM,FGAP,FFGAP
  203 FORMAT(5E14.7)
C PGAP AND FFGAP ARE THE INCREMENTS OF INTEGRATION FOR FREE SURFACE.
C FLI IS USED FOR THE LIMIT BETWEEN PGAP & FFGAP.
C MONK IS THE INDEX FOR STOPPING THE CALCULATION OF THE FREE SURFACE.
  READ(5,339) XLIMIT,FLI
  339 FORMAT(2E14.7)
  READ(5,349) NPSUR1,NPSUR2,MONK,NGO1,NGO2,NGO3
  349 FORMAT(6I4)
C NGO1=0 MEANS THE CALCULATION OF FREE SURFACE SHAPE.
C NGO2=0 MEANS PRINTING OUT OF CP.
C NGO3=0 MEANS PRINTING OUT OF ROP,XMA,XOO,ETC.

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      MPM=5
      MPH1=MPM-1
      KPM1=MPH1
      C MPH1 NO. OF DISCRETE POINTS OVER SPAN.
      C NITER: NO. OF CALCULATIONS FOR DIFFERENT SETS OF PARAMETERS.
      C MSTOP: NO. OF ITERS. WHICH STOPS THE LOOP.
      C MSTOP=1 FOR FLAT-PLATE CASE.
      C MAXIT: NOS. OF ITERS. WITHIN OXFNEW.
      C NHK: CONTROL INDEX FOR PARAMETERS
      C      NHK=1 FOR ALFA1
      C      NHK=2 FOR XOLS(MAX. LENGTH OF CHORD).
      C      NHK=3 FOR HMMH(SUBMERGENCE).
      C      NHK=4 FOR SIGMA.
      C DE=1.E-4 USUALLY IN OXFNEW.
      C ASPI ASPECT RATIO.
      PAI=3.141592653
      DO 999 IJKL=1,NITER
      ALFAZD=ALFAZS
      SIGMA=SIGMS
      HMMH=HMMH3
      IF(NHK.EQ.1) GO TO 240
      IF(NHK.EQ.3) GO TO 242
      SIGMA=SIGMS+SIGINC*FLOAT(IJKL-1)
      GO TO 243
242 HMMH=HMMH3+0.25*FLOAT(IJKL-1)
      GO TO 243
240 ALFAZD=ALFAZS-2.*FLOAT(IJKL-1)
243 CONTINUE
      FLAPAN=0.
      XM=XXM
      WRITE(6,998) ALFAZD,HMMH
998 FORMAT(1X,20H-----ALFA ZERN=,E14.7,10H-----,4HMMH=,E14.7
      X)
      C ASPI IS EPSILON; 1/AR.
      ASPI=1./ASP
      C BIGS IS CHORD LENGTH IN (X,Y), ALWAYS 2 FOR THE RECTANGULAR PLANFORM.
      C BIG IS CHORD LENGTH IN (SMALL-X,SMALL-Y) BASED ON SPAN=2.
      C CIRCULATION IS GIVEN BY THE DATA OF PREVIOUS CALCULATION.
      DO 198 JKN=1,4
      READ(5,197) CIRCNC(JKN)
198 WRITE(6,1050) JKN,CIRCNC(JKN)
1050 FORMAT(3X,14HINITIAL CIRCNC(,I2,2H)=,E14.7)
197 FORMAT(E14.7)
      CALL CDEF(CIRCNC,AG)
      CALL GAMC(CIRCNC,AG)
      DO 142 IE=1,KPM1
      CIRCNC(IE)=CIRCNC(IE)
142 CIRCNC(IE)=CIRCNC(IE)
      BTOL=2.E-4
      BTOL3=9.E-4
      ERC=1.E-2
      CLE=1.E-4
      C CAVIT. NO.=SIGMA, AND PSIZ.
      ALFAZ=ALFAZD*PAI/180.
      WRITE(6,511) SIGMA
511 FORMAT(10X,11HCAVIT. NO =,E14.7)
      CCC=ALING(1.+SIGMA)/(2.*PAI)
      C THIS IS THE SWEEP-BACK CASE USED FOR THE 3-D EXPERIMENT.
      BIGD=1./7.*4./ASP
      PSIZ=BIGD/ASPI
      HMMH=HMMH3+BIGD
      DO 615 INP=1,MPH1
      READ(5,616) PSSD(INP)
615 WRITE(6,1040) INP,PSSD(INP)
1040 FORMAT(3X,5HPSIZ(,I2,2H)=,E14.7)
616 FORMAT(E14.7)

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DO 999 I111=1, KSTOP
DO 888 ISP=1, NPM1
ZTH=PAI*(5.-FLOAT(ISP))/R,
IF(ISP, EQ, 4) GO TO 1130
GO TO 1131
1130 IF(NISP, EQ, 0) ZTH=PAI/R, +PAI*FLOAT(NNISP)/64,
1131 CONTINUE
BIG=BIG*ISP
CZTH=CNS(ZTH)
IF(CZTH, GT, 0.5) BIG=BIG- BIG*(CZTH-0.5)
BIG9=BIG*ASP
C DOWN IS DOWN WASH VELOCITY IN TERMS OF ANGLE,
DOWN=0,
DO 148 IDN=1, 7
DOWN=DOWN+FLOAT(IDN)*AG(IDN)*SIN(IDN*ZTH)
DOWN=0.5*DOWN/SIN(ZTH)
DOWND=DOWN*180./PAI
WRITE(6, 228) DOWN
228 FORMAT(5X, 26HDOWN WASH ANGLE IN DEGREE=, E14, 7)
SBETA=ALFAZ+DOWN
DO 888 ISE=1, NCON
WRITE(6, 505) ISP, ISE
505 FORMAT(30X, 25H---POSITION OF SPAN---, I2, 1X, 13HNO. OF ITER., =, I2)
WRITE(6, 504) BIG9, ISP, ASP
504 FORMAT(10X, 5HBIG9=, E14, 7, 1X, 4HISPAN=, I2, 1X, 3HAR=, E14, 7)
STOL=1.E-5
LPM=71
LPK=20
LPM1=LPM-1
LPM2=LPM-2
LPM3=LPM-3
LPM4=LPM-4
C ICPI IS USED FOR CONTROLLING PROGRAM; 0 FOR ITER. 1 FOR THE REST.
C FIND XSIB, XSIC, XSID, XSII, USING 'NEWTON'.
C SXSI(1)=XSIB
C SXSI(2)=XSIC
C SXSI(3)=XSID
C SXSI(4)=XSII
ITERA=1
IF(I111, GE, 2) GO TO 744
IF(ISE, GE, 2) GO TO 744
C DATA FOR SXSI(1): NEED FOUR CARDS WHICH COVER ALL SPAN,
READ(5, 620) SXSI(1), SXSI(2), SXSI(3), SXSI(4)
620 FORMAT(4E14, 7)
GO TO 811
744 DO 745 LA=1, 4
745 SXSI(LA)=SXSID(LA, ISP)
811 PSIZ=PSID(ISP)
WRITE(6, 540) PSIZ
540 FORMAT(5X, 5HPSIZ=, E14, 7)
160 ICPI=0
WRITE(6, 102) ITERA
102 FORMAT(10X, 14HITERATION NO., =, I2)
IF(ITERA, GE, 2) STOL=STOL8
IF(ITERA, EQ, NSTOP) STOL=STOLL
CALL NXFNEW(SXSI, STOL, MAXIT, ITN, X34LA)
630 CONTINUE
231 DO 754 LB=1, 4
754 SXSID(LB, ISP)=SXSI(LB)
235 DO 537 IN1=1, 4
XSN(IN1)=SXSI(IN1)
537 WRITE(6, 536) IN1, SXSI(IN1)
536 FORMAT(10X, 5HSXSI(, I1, 2H)=, E14, 7)
SX4=SXSI(4)
SXX4=SX4
IF(FLAG, EQ, 1) SXSI(4)=SXSI(3)

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IF(IFLAG,EO,1)-XSN(4)=XSN(3)-
ICPI=1
C CALCULATION OF GAMMA---CIRCEN(ISP)
VA=(SXSI(1)+1.)*0.5
VB=(1.-SXSI(1))*0.5
UX=SXSI(2)+VB
UXY=UX/VA
UXX2=UX*UX
WA=SQRT(UXX2-1.)
Q2=CCC1*(-VA*WA+VB*ALOG(ABS(UXY+WA)))
R2=-VB*SBETA
WB=VB/VA
S2=VA*SQRT(1.-WB**2)-VB*(0.5*PAI-ARCSIN(WB))
UY=SXSI(3)+VB
UXX=UY/VA
UXX2=UXX*UXX
WB=SQRT(UXX2-1.)
T2=-CCC1*(VA*WB-VB*ALOG(UXX+WB))
RZERO=Q2+R2+S2+T2
CIRCH(ISP)=RZERO*ASPI*PSIZ /SXSI(4)
WRITE(6,515) ISP,CIRCH(ISP)
515 FORMAT(1X,11H-----CIRCH(I2,2H)=,E14.7)
CSPACE=(1.+SXSI(1))/FLOAT(LPK)
MCSPACE=0.5*CSPACE
FSPACE=CSPACE/FLOAT(LPM-LPK)
MFSPACE=0.5*FSPACE
XBET=-1.+CSPACE*FLOAT(LPK-1)
ICPI=1
C ICPI=0 FOR FINDING SXSI(I), I.E., SXSI(I)=YXS(I); ICPI=1 FOR THE REST,
C CALCULATION OF PRESSURE DISTRIBUTION 'CP'.
DO 25 LP=1,LPM
C FIND CP(XSIP) NEXT.
SPACE=CSPACE
IF(LP.GT.LPK) GO TO 91
XSIN=-1.+SPACE*FLOAT(LP-1)
GO TO 92
91 SPACE=FSPACE
XSIN=XBET+SPACE*FLOAT(LP-LPK)
92 IM=LP
IF(LP.EQ.1) GO TO 52
IF(LP.EQ.LPM) GO TO 52
CALL CCCPPP(XSIN,Q2,IM)
GO TO 53
52 Q2=1.+SIGMA
53 CP(LP)=1.-Q2/(1.+SIGMA)
25 CONTINUE
DO 100 LP=1,LPM
C FIND XXX(XSIP) FIRST.
XXX(LP)=SARC(LP)
BETAN(LP)=SBETA
BETAD(LP)=ALFAZ
IF(NGN2,GE,1) GO TO 1080
WRITE(6,101) LP,SARC(LP),XXX(LP),CP(LP),BETAN(LP)
101 FORMAT(1X,2HI=,13,1X,5HSARC=,E14.7,1X,4HXXX=,E14.7,1X,3HCP=,E14.7,
1X,6HBETAN=,E14.7)
1080 CONTINUE
100 CONTINUE
C FIND LIFT, DRAG AND MOMENT COEFFICIENTS.
XII(1)=-1./SQRT(1.+SIGMA)
XII(LPM)=SXSI(1)/SQRT(1.+SIGMA)
POW=SXSI(4)*PAI
PSII=PSIZ
DO 105 ITK=1,LPM
IF(ITK.GT.LPK) GO TO 106
XPS=-1.+CSPACE*FLOAT(ITK-1)
GO TO 105
106

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100 XPS=XSET+FS*SPACE*FLOAT(ITK-LPK)
105 XJJ(ITK)=PSII/(POW*(XPS-SXSI(4)))
DO 107 IYL=1,LPM
  COBET(IYL)=COS(BETAQ(IYL))
  BIOET(IYL)=SIN(BETAQ(IYL))
  FQA=CP(IYL)*XII(IYL)*XJJ(IYL)
  FL(IYL)=FQA*COBET(IYL)
107 PD(IYL)=FQA*SIBET(IYL)
  SPACE=CSPACE
  CLIFT=0.5*CSPACE*FL(2)+0.5*FS*SPACE*FL(LPM1)
  CORAG=0.5*CSPACE*PD(2)+0.5*FS*SPACE*PD(LPM1)
DO 111 IUA=2,LPM 3,2
  IF(IUA.GE.LPK)-SPACE=FS*SPACE
  CLIFT=CLIFT+SPACE*(FL(IUA)+4.*FL(IUA+1)+FL(IUA+2))/3,
  CORAG=CORAG+SPACE*(PD(IUA)+4.*PD(IUA+1)+PD(IUA+2))/3,
  CM=0,
  IZI=LPM-1
DO 115 LIQ=1,IZI
  XCE=(XXX(LPM-LIQ)+XXX(LPM-LIQ+1))*0.5
  XINC=XXX(LPM-LIQ+1)-XXX(LPM-LIQ)
115 CM=CM+0.5*(CP(LPM-LIQ)+CP(LPM-LIQ+1))*XCE*XINC
  CHM(ISP)=CM
  XLQD=CLIFT/CORAG
  CLIFT=CLIFT/DIGS
  CORAG=CORAG/DIGS
  WRITE(6,117) CLIFT,CORAG,CM,XLQD
117 FORMAT(10X,6HCLIFT=,E14.7,1X,6HCORAG=,E14.7,1X,8HCMOMENT=,E14.7,1X
  X,4HXLQD=,E14.7)
  CLO=CLIFT*(1.+SIGMA)
  CDD=CORAG*(1.+SIGMA)
  WRITE(6,293) CLO,CDD
293 FORMAT(1X,9H-----LIFT DRAG COEFFTS BASED ON U1-----,4HCLO=,E14.7,
  XIX,4HCDD=,E14.7)
  CCDD(ISP)=CDD*BIGS
  KSTOP1=KSTOP-1
  IF(IIII.LE.KSTOP1) GO TO 765
  IF(ISE.LT.NCQ4) GO TO 765
  IF(NGI1.GE.1) GO TO 765
C CAVITY SHAPE.
  DT=1.E-5
  XLAST=(SXSI(3)-SXSI(1))/NDIV
  GAUL=(SXSI(3)-SXSI(1)-XLAST)/NDIVL
  GAUS=XLAST/(NCAVIT-NDIVL+1)
  GAL=(-1.-SXSI(2))/NCAVIT
  NDI=NDIVL+2
  NNI=NCAVIT+1
  XU=SXSI(1)
DO 120 ISH=1,NNI
  GAU=GAUL
  IF(ISH.GE.NDI) GAU=GAUS
  IF(ISH.EQ.2) XU=SXSI(1)
  XU=XU+GAU
  XL=-1.-GAL*FLQAT(ISH-1)
  IF(ISH.EQ.1) XU=XU+XU*DT
  IF(ISH.EQ.1) XL=XL-ABS(XL)*DT
  IF(ISH.EQ.NNI) XL=SXSI(2)+ABS(SXSI(2))*DT
  ICONT=3
  CALL XINTER(XU,AXU(ISH),AYU(ISH),ICONT)
  ICONT=4
120 CALL XINTER(XL,AXL(ISH),AYL(ISH),ICONT)
  ARE=1./SORT(1.+SIGMA)
C CAVITY SHAPES HERE ARE RELATIVE POSITIONS, THEN ADD (XB,YB) OR (XA,YA)
  FOR ABSOLUTE POSITIONS.
  IDUL=2
  XXL(1)=0,
  YYL(1)=0,

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XXU(1)=0.
YYU(1)=0.
NNM=NCVIT-1
DO 121 ISI=1,NNM,2
  GAI=GAUL
  IF (ISI.GE.NDIVL) GAI=GAUS
  XXU(ISI+2)=XXU(ISI)+GAU*(AXU(ISI)+4.*AXU(ISI+1)+AXU(ISI+2))*AF/3.
  YYU(ISI+2)=YYU(ISI)+GAU*(AYU(ISI)+4.*AYU(ISI+1)+AYU(ISI+2))*AF/3.
  XXL(ISI+2)=XXL(ISI)-GAL*(AXL(ISI)+4.*AXL(ISI+1)+AXL(ISI+2))*AF/3.
  YYL(ISI+2)=YYL(ISI)-GAL*(AYL(ISI)+4.*AYL(ISI+1)+AYL(ISI+2))*AF/3.
121 WRITE(6,126)
126 FORMAT(22X,18HUPPER CAVITY SHAPE,24X,18HLOWER CAVITY SHAPE)
  DO 122 ISJ=1,NNI,2
122 WRITE(6,123) ISJ,XXU(ISJ),YYU(ISJ),XXL(ISJ),YYL(ISJ)
123 FORMAT(5X,4HISJ=,I3,1X,4HXXU=,E14.7,1X,4HYYU=,E14.7,5X,4HXXL=,E14.
  7,1X,4HYYL=,E14.7)
  I034=NFSUR1
  D34=5XSI(4)-5XSI(3)
  IF (IPLAG.EQ.1) D34=5XSI(4)
  DING=D34/PLIAT(I034)
  IF (D34.LE.XLIMIT) I034=NFSUR2
  IF (D34.LE.XLIMIT) DING=D34/FLOAT(I034)
  J034=I034-1
  DO 130 JSH=1,J034
  XU=5XSI(3)+DING*FLOAT(JSH)
  ICONT=5
130 CALL XINTEG(XU,XXU(JSH),YYU(JSH),ICONT)
  XXU(1)=XXU(101)
  YYU(1)=YYU(101)
  IDI=I034-3
  DO 131 ISJ=1,IDI,2
  XXU(ISJ+2)=XXU(ISJ)+DING*(WXU(ISJ)+4.*WXU(ISJ+1)+WXU(ISJ+2))*AF/3.
  YYU(ISJ+2)=YYU(ISJ)+DING*(WYU(ISJ)+4.*WYU(ISJ+1)+WYU(ISJ+2))*AF/3.
131 WRITE(6,132)
132 FORMAT(1X,24HUPPER WAKE SHAPE IS-----)
  DO 133 JSJ=1,I034,2
133 WRITE(6,234) JSJ,XXU(JSJ),JSJ,YYU(JSJ)
234 FORMAT(5X,3HXX(,I3,2H)=,E14.7,1X,3HY(,I3,2H)=,E14.7)
  XXU1=XXU(I034-1)
  YYU1=YYU(I034-1)+PSIZ
  XU1=5XSI(4)+DING
  N10=10
  NFS=0
  WRITE(6,136)
136 FORMAT(1X,23HFREE SURFACE SHAPE-----)
  CALL XINTEG(XU1,FXU1,FYU1,ICONT)
  GGAP=FFGAP
135 NFS=NFS+1
  IF (NFS.GE.NCINK) GO TO 137
  IF (NFS.EQ.1) GO TO 408
  IF (XXU2.LE.FLI) GGAP=FGAP
408 XU2=XU1+GGAP
  CALL XINTEG(XU2,FXU2,FYU2,ICONT)
  XU3=XU2+GGAP
  CALL XINTEG(XU3,FXU3,FYU3,ICONT)
  XXU2 = XXU1 + (FXU1+4.*FXU2+FXU3)*AF*GGAP/3.
  YYU2 = YYU1 + (FYU1+4.*FYU2+FYU3)*AF*GGAP/3.
  XU1=XU3
  FXU1=FXU3
  FYU1=FYU3
  XXU1=XXU2
  YYU1=YYU2
  IF (NFS.GT.N10) N10=N10+10
  IF (XXU2.GE.10.) GO TO 139
  IF (XXU2.GE.2.) GO TO 333
  IF (NFS.NE.N10) GO TO 139

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533 WRITE(6,138) XXU2,YYU2,NF3
138 FORMAT(5X,3HXP=,E14.7,5X,3HYF=,E14.7,1X,4HNP3=,I4)
139 IF(XXU2.GE.-2.) GO TO 135
137 CONTINUE
765 WRITE(7,76) SXSI(1),SXSI(2),SXSI(3),SX4
768 FORMAT(4E14.7)
C FIND THE NEW PSIZ FROM EQN. 19-1-1.
C FIRST, FIND R00 & THIO.
C IF PLAN FORM IS CHANGED, MUST CHANGE THE ABOVE EQN.
C X00 & Y00 ARE THE COORDINATES IN EQNS 25-1 & 2.
C R001,X00L,Y00L ARE USED AS STARTING VALUES FOR INTEGRNS. IN 25-1 & 2.
FINC=1.E-1
FIN=FINC
220 NY=1
303 TOP=PAI-FIN
IF(TOP.LE.1.E-1) GO TO 302
C TOP DENOTES THETA 0 PRIME IN P27-2.
C ROP DENOTES R-0-PRIME IN 26-1 & 27-2.
ROP=(PAI-TOP)*SXSI(4)/8IN(TOP)
WRITE(6,222) ROP
222 FORMAT(1X,4HR0P=,E14.7)
ROP2=ROP**2
Y42=SXSI(4)**2
CPT=COS(PAI-TOP)
DR0=2.*SXSI(4)*ROP*CPT
C R00---- P 27-2.
C Y00---- P27-2.
R00=SQRT(ROP2+Y42-DR0)
UT=SXSI(4)-ROP*CPT
T00=ARCS(UT/R00)
C FIND IM & RE IN EQNS. 25-1 & 2.
CALL FCN1(R00,T00,X00K,Y00K,NY)
X00=X00K
Y00=Y00K
Y00H=-CIRCD(ISP)/(PAI*X00)-D00H
C MCON=1 FOR VELOCITY 'V'.
C MCON=0 FOR SUBMERGENCE 'Y000'.
MCON=1
CALL OPSIMA(X00,VELO,MCON)
XMA=ABS(VELO-Y00H)
IF(NGN3.GE.1) GO TO 1090
WRITE(6,304) XMA,EP8Q,X00,Y00,VELO
304 FORMAT(1X,4HXMA=,E14.7,1X,6HEP8Q=,E14.7,1X,4HX00=,E14.7,1X,4HY00=,E14.7,5HVELO=,E14.7)
1090 CONTINUE
IF(XMA.LE.EP8Q) GO TO 302
FIN=FIN+FINC
NY=NY+1
GO TO 303
302 CONTINUE
MCON=0
CALL OPSIMA(X00,Y00,MCON)
C HMM IS FOR SUBMERGENCE.
206 BOTOM=ASPI-(Y00+Y000)/PSIZ
PSIZ=HMM/BOTOM
PSSD(ISP)=PSIZ*(1.-XXM)+PSSD(ISP)*XXM
DO 266 NIK0=1,7
266 WRITE(6,267) NIK0,AG(NIK0)
267 FORMAT(1X,3HAG(,I2,2H)=,E14.7)
C TOTAL GAMMA FROM EQN. 30-1.
TGA=5*AG(1)*ARAI
DO 272 NITA=2,7
XNT1=FLDAT(NITA-1)

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XNT2=FLD(NT(NITA+1))
272 TGA=TGA+0.5*AG(NITA)*(SIN(XNT1*PAI)/XNT1-SIN(XNT2*PAI)/XNT2)
CLA=TGA*ASP/2.
WRITE(6,277) TGA,CLA
277 FORMAT(1X,4MTGA=E14.7,1X,5MCLA=E14.7)
888 CONTINUE
C DETERMINE THE COEFFICIENTS OF FOURIER EXPANSION FOR CIRCULATION.
DO 376 J0HN=1,4
376 CIRC(J0HN)=CIRC(J0HN)*(1.-XXM)*CIRC(J0HN)*XXM
DO 327 INK=1,4
327 CIRC(INK)=CIRC(INK)
327 CIRC(INK)=CIRC(INK)
CALL CDEF(CIR,AG)
CALL GAM(CIR,AR)
DO 541 LIN=1,4
WRITE(7,616) CIRC(LIN)
541 WRITE(6,542) LIN,CIRC(LIN)
542 FORMAT(3X,6HCIRC(,11,2H)=,E14.7)
DO 551 LIN=1,4
WRITE(6,617) LIN,PSSD(LIN)
551 WRITE(7,616) PSSD(LIN)
617 FORMAT(2X,8H---PSSD(,12,2H)=,E14.7)
IF(IIII.LT.KSTOP) GO TO 999
C NEED A CHANGE FOR DIFF. AR. *****
C CALCULATE 3-D DRAG.
CALL CDEF(CDD,AGD)
CALL CDEF(CMM,AGC)
TM=.5*AGC(1)*PAI
TD=.5*AGD(1)*PAI
DO 1120 NDT=2,7
XND1=FLD(NT(NDT-1))
XND2=FLD(NT(NDT+1))
PDI=SIN(XND1*PAI)/XND1-SIN(XND2*PAI)/XND2
TM=TM+.5*AGC(NDT)*PDI
TD=TD+.5*AGD(NDT)*PDI
1120 TD=TD/4.
TM=TM/4.
WRITE(6,1121)TD, TM
1121 FORMAT(20X,5HCD3D=E14.7,3X,5HCD3D=E14.7)
C TOTAL GAMMA FROM EQN. 30-1.
TGA=.5*AG(1)*PAI
DO 279 NITA=2,7
XNT1=FLD(NT(NITA-1))
XNT2=FLD(NT(NITA+1))
279 TGA=TGA+0.5*AG(NITA)*(SIN(XNT1*PAI)/XNT1-SIN(XNT2*PAI)/XNT2)
CLA=TGA*ASP/2.
WRITE(6,277) TGA,CLA
999 CONTINUE
STOP
END

SUBROUTINE OPSIM1(ANSA,N12)
DIMENSION XST(5)
COMMON FLAPAN,CLD,CIRC(20),MMH,ALFA7,SIGMA,SBETA,XXM,ICPI
COMMON IDUL,XA,XB,XC,TANG,EP,YC,YR,URIG3,XLBIGS,BIGS,SMALS,333
COMMON XSN(5),CC1,CLE,ERC,YYY,XM,ITERA,SXSIN(5),SXSIO(5),YXS(5)
COMMON PSIZ,LP,SARC(513),SARCN(513),LPM,DE,ISP,ASPI,IIII
COMMON BETAN(513),BETAM(513),IJ,LPK,XII(200),XJJ(200),XDX
COMMON AN(7),MRM,MPK,R7BRND(20),CIRCDI(20),NISR,NNISR
COMMON IFLAG,SXX44

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IF(ICPI.EQ.0) GO TO 9
DO 10 IQ=1,4
10 XST(IQ)=XSN(IQ)
GO TO 12
9 DO 11 IH=1,4
11 XST(IH)=YXS(IH)
12 CSPACE=(1.+XST(1))/FLOAT(LPK)
FSPACE=CSPACE/FLOAT(LPM-LPK)
LPK2=LPK-2
XBET=-1.+CSPACE*FLOAT(LPK-1)
ANSA=0.
LPM3=LPM-3
XSI1=-1.+CSPACE
BE1=BETAN(2)
AP1=(1.+XSI1)*(XST(1)-XSI1)
AP1S=SQRT(AP1)
F3=BE1/AP1S
YUS=XST(4)
0 IF(N12.EQ.1) GO TO 5
IF(I,12,GE.3) YUS=XOX
F3=F3/(XSI1-YUS)
5 DO 1 I=2,LPM3,2
11 F1=F3
SPACE=CSPACE
IF(I,GE,LPK) GO TO 30
XSI2=-1.+SPACE*FLOAT(I)
XSI3=XSI2+SPACE
GO TO 31
30 SPACE=FSPACE
XSI2=XBET+SPACE*FLOAT(I-LPK+1)
XSI3=XSI2+SPACE
31 BE2=BETAN(I+1)
BE3=BETAN(I+2)
AP2=(1.+XSI2)*(XST(1)-XSI2)
AP3=(1.+XSI3)*(XST(1)-XSI3)
AP2S=SQRT(AP2)
AP3S=SQRT(AP3)
F2=BE2/AP2S
F3=BE3/AP3S
IF(N12.EQ.1) GO TO 6
F2=F2/(XSI2-YUS)
F3=F3/(XSI3-YUS)
6 F3SUM=(F1+F2+F3)*SPACE/3.
ANSA=ANSA+F3SUM
1 CONTINUE
SQ1=SQRT(1.+XST(1))
ANT1=BETAN(1)*2.*SQRT(CSPACE)/SQ1
ANT2=BETAN(LPM)*2.*SQRT(FSPACE)/SQ1
14 IF(N12.EQ.1) GO TO 7
ANT1=ANT1/(-1.-YUS)
ANT2=ANT2/(XST(1)-YUS)
25 ANSA=ANSA+ANT1+ANT2
7 RETURN
END

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SUBROUTINE OPSIM2(ANS2)

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DIMENSION X(3),DA(3),DR(3),DC(3),XTT(3),YY(3),THA(3),THB(3)
DIMENSION XITB(3),XITC(3),U1(3),EXU(3),DO(3),OO(3),W(3),FCNS(3)
DIMENSION XITA(3),XST(5),XTIM(513),XITN(513)
COMMON FLAPAN,CLD,CIRCD(20),HHH,ALFAZ,SIGMA,SBETA,XXM,ICPI
COMMON IDIUL,XA,XB,XC,TANG,EP,YC,YR,UBIGS,XLBIGS,BIGS,SMALS,SSS
COMMON XSN(5),CCC1,CLE,ERC,YYY,XM,IIERA,SXSIN(5),SXSTOO(5),YXS(5)
COMMON PSIZ,LP,SARC(513),SARCO(513),LPM,DE,ISP,ASPI,IIII
COMMON BETAN(513),BETAM(513),IJ,LPK,XII(200),XJJ(200),XOX
COMMON AN(7),MPM,MPK,RZEROD(20),CIRCDI(20),NISP,NNISP
COMMON IFLAG,SXX44

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00 13 I6=1,4
13 XST(I6)=YXS(I6)
PAI=3.141592653
CSPACE=(1.+XST(1))/PLNAT(LPK)
HCSpace=0.5*CSpace
FSPACE=CSpace/FLOAT(LPM-LPK)
HFSpace=0.5*FSPACE
XBET=-1.+CSpace*FLOAT(LPK-1)
PL=2.*SQRT(XST(1))
PT=XST(1)-1.
PS=2.*XST(1)
PU=PAI*XST(4)*(1.+XST(1))
FCN3(3)=XST(1)/(SQRT(1.+SIGMA)*XST(4)*PAI*(XST(4)-XST(1)))
FCN3(3)=FCN3(3)*PSIZ
LPKI=LPM-LPK+1
00 1 IP=1,LPM
IF(IP.EQ.1) GO TO 2
HSPACE=HFSpace
SPACE=FSPACE
IF(IP.GT.LPKI) GO TO 30
X(1)=XST(1)-SPACE*FLOAT(IP-LPKI-1)
X(2)=X(1)-HSPACE
X(3)=X(1)-SPACE
GO TO 31
30 HSPACE=HCSpace
SPACE=CSpace
X(1)=XBET-SPACE*FLOAT(IP-LPKI-1)
X(2)=X(1)-HSPACE
X(3)=X(1)-SPACE
31 FCN3(1)=FCN3(3)
NK=3
IF(IP.EQ.LPM) NK=2
00 8 I=2,NK
CALL TH1TH2(THA(I),THB(I),X(I))
DA(I)=X(I)+1.
DB(I)=XST(1)-X(I)
DC(I)=SQRT(DA(I)*DB(I))
XIT(I)=0.
5 U1(I)=-CCCI*(2.*PAI-THA(I)-THB(I))+XIT(I)
EXU(I)=EXP(U1(I))
DD(I)=PL*DC(I)+X(I)*RT+PS
DQ(I)=(XST(4)-X(I))*PU
W(I)=PSIZ*DD(I)/DQ(I)
8 FCN3(I)=EXU(I)*W(I)
IF(IP.EQ.LPM) GO TO 20
GO TO 21
20 FF3=1./(SQRT(1.+SIGMA)*XST(4)*PAI*(XST(4)+1.))
FF3=FF3*PSIZ
FCN3(3)=FF3
21 SUM=(FCN3(1)+FCN3(2)*4.+FCN3(3))*HSPACE/3.
ANS2=ANS2+SUM
IF(IJ.EQ.9) SARC(LPM-IP+1)=ANS2
GO TO 1
2 SARC(LPM)=0.
ANS2=0.
1 CONTINUE
RETURN
END

SUBROUTINE NF9IM4(X0,Y0,MCON)
DIMENSION Y0M(9),Y0DM(9)
COMMON FLAPAN,CLD,CIRCD(20),HHH,ALFAZ,SIGMA,SBEFA,XXM,ICPI
COMMON IOUL,XA,XB,XC,TANG,EP,YC,YR,UBIGS,XLBIGS,BIGS,SMAL8,333
COMMON XSN(5),CCCL,CLE,ERC,YYY,XM,ITERA,SXSIN(5),SXSIO(5),YXS(5)
COMMON PSIZ,LP,SARC(513),SARCO(513),LPM,DE,ISP,ASPI,IIII
COMMON BETAN(513),BETAM(513),IJ,LPK,XTI(200),XJJ(200),XOX

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COMMON AD(7),MPM,MPK,RZEROD(20),CIRCDI(20),NISP,NNISP
COMMON IFLAG,9XX04
CISP IDENTIFIES THE SPANWIRE POSITION.
PAI=3.141592653
YU=0.
YUM=0.
Z=COS(PAI*FLOAT(5-ISP)/8.)
IF(ISP.EQ.4) GO TO 30
GO TO 11
30 IF(NISP.GE.1) GO TO 11
Z=COS(PAI/8.+PAI*FLOAT(NNISP)/64.)
11 CONTINUE
ZZ=0.
IF(ISP.EQ.1) GO TO 4
AT0=SQRT(X0**2+Z**2)
YT=CIRCD(1)*(X0+AT0)
YI=YT/Z**2
YIM=YI
IF(MCON.EQ.1) YI=YI/AT0
YIM=YI
GO TO 5
4 YI=-CIRCD(1)/(2.*X0)
IF(MCON.EQ.1) YI=CIRCD(1)/(2.*X0**2)
YIM=YI
5 CONTINUE
DO 1 LA=1,4
LB=LA+1
ZP=COS(PAI*FLOAT(4-LA)/8.)
IF(LA.EQ.3) GO TO 20
GO TO 21
20 IF(NISP.GE.1) GO TO 21
ZP=COS(PAI/8.+PAI*FLOAT(NNISP)/64.)
21 CONTINUE
Z1P=(ZP-Z)*0.5+Z
Z2N=-ZP
Z1N=-Z1P
ZZ=ZP
A1P=SQRT(X0**2+(Z-Z1P)**2)
A1N=SQRT(X0**2+(Z-Z1N)**2)
A2P=SQRT(X0**2+(Z-Z2P)**2)
A2N=SQRT(X0**2+(Z-Z2N)**2)
B1P=X0+A1P
B1N=X0+A1N
B2P=X0+A2P
B2N=X0+A2N
IF(MCON.EQ.1) B1P=B1P/A1P
IF(MCON.EQ.1) B1N=B1N/A1N
IF(MCON.EQ.1) B2P=B2P/A2P
IF(MCON.EQ.1) B2N=B2N/A2N
GAI=CIRCDI(LA)
YU1=GAI*B1P/(Z1P-Z)**2
YU1=GAI*B1N/(Z1N-Z)**2
IF(LA.EQ.4) GO TO 10
GAD=CIRCD(LB)
YU2=GAD*B2N/(Z2N-Z)**2
IF(LB.EQ.ISP) GO TO 2
YU2=GAD*B2P/(Z2P-Z)**2
GO TO 3
10 YU2=0.
YUM2=0.
GO TO 3
2 YU2=-CIRCD(LB)/(2.*X0)
IF(MCON.EQ.1) YU2=CIRCD(LB)/(2.*X0**2)
3 YU=YU+(YI+4.*YU1+YU2)*(Z2P-Z1P)/3.
YUM=YUM+(YIM+4.*YU1+YU2)*(Z2P-Z1P)/3.
YI=YU2

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1 YIM=YOMA
  YU=(YU+YUM)/(2.*PAI)
  RETURN
  END

SUBROUTINE TH1TH2(TH1,TH2,X)
  DIMENSION XST(5)
  COMMON FLAPAN,CLD,CIRCD(20),MMH,ALFAZ,SIGMA,SBETA,XXM,ICPI
  COMMON IDUL,XA,XB,XC,TANG,EP,YC,YR,UBIGS,XLBIGS,BIGS,SMALS,SSS
  COMMON XSN(5),CCC1,CLE,ERC,YYY,XM,ITERA,SXSIO(5),SXSIO(5),YXS(5)
  COMMON PSIZ,LP,SARC(513),SARCO(513),LPM,DE,ISP,ASPI,IIII
  COMMON BETAN(513),BETAM(513),IJ,LPK,XII(200),XJJ(200),XQX
  COMMON AN(7),MPM,MPK,RZEROD(20),CIRCDI(20),NISP,NNISP
  COMMON IFLAG,SXX44
  PAI=3.141592653
  IF(ICPI.EQ.0) GO TO 10
  DO 20 IS=1,4
20  XST(IS)=XSN(IS)
  GO TO 30
10  DO 40 JT=1,4
40  XST(JT)=YXS(JT)
30  D1=XST(2)+1.
  D2=XST(2)-XST(1)
  D3=X+1.
  D4=XST(1)-X
  G1=D1+D4
  G2=D2+D3
  A1=2.*SQRT(G1+G2)
  B1=-G1+G2
  TH1=ATAN(A1/B1)
  IF(B1.LT.0.) TH1=PAI+TH1
  H1=XST(3)+1.
  H2=XST(3)-XST(1)
  G3=H1+D4
  G4=H2+D3
  A2=2.*SQRT(G3+G4)
  B2=-G3+G4
  TH2=ATAN(A2/B2)
  IF(B2.LT.0.) TH2=PAI+TH2
  RETURN
  END

SUBROUTINE CCCPPP(X8I,Q2,IS)
  DIMENSION INT(10)
  COMMON FLAPAN,CLD,CIRCD(20),MMH,ALFAZ,SIGMA,SBETA,XXM,ICPI
  COMMON IDUL,XA,XB,XC,TANG,EP,YC,YR,UBIGS,XLBIGS,BIGS,SMALS,SSS
  COMMON XSN(5),CCC1,CLE,ERC,YYY,XM,ITERA,SXSIO(5),SXSIO(5),YXS(5)
  COMMON PSIZ,LP,SARC(513),SARCO(513),LPM,DE,ISP,ASPI,IIII
  COMMON BETAN(513),BETAM(513),IJ,LPK,XII(200),XJJ(200),XQX
  COMMON AN(7),MPM,MPK,RZEROD(20),CIRCDI(20),NISP,NNISP
  COMMON IFLAG,SXX44
  JIS=0
  PAI=3.141592653
  ACP1=SQRT((1.+X8I)*(XSN(1)-X8I))
  ACP2=2.*SQRT(XSN(1))
  ACP3=ACP2*ACP1+X8I*(XSN(1)+1.)*2.*XSN(1)
  ACP4=1.+XSN(1)
  ACP5=ACP3/ACP4
  CALL TH1TH2(TH1,TH2,XST)
1  P3=0.
2  UA=-CCC1*(2.*PAI-TH1-TH2)+P3
  EIIA=EXP(IIA)
  XII(18)=EIIA+ACP5
  Q=-X8I/XII(18)
  Q2=Q+Q2
  RETURN
  END

```

END

```
SUBROUTINE OXFNEW(X,ATOL,M,I,X34LA)
DOUBLE PRECISION ADP1,ADP2,ADP4,DOP1
DIMENSION F(4),P(50,4),X(4),INT(10),Q(4,4)
COMMON FLAPAN,CLD,CIRCD(20),MMH,ALFAZ,SIGMA,SBETA,XXM,ICPI
COMMON IDUL,XA,XB,XC,TANG,EP,YC,YR,URIGS,XLBIGS,BIGS,SMALS,SSS
COMMON XSN(5),CCC1,CLE,ERC,YYY,XM,ITERA,XXSIO(5),XXSIOQ(5),YXS(5)
COMMON PSIZ,LP,SARC(513),SARCN(513),LPM,DE,ISP,ASPI,IIII
COMMON BETAN(513),BETAM(513),IJ,LPK,XII(200),XJJ(200),XOX
COMMON AN(7),MPM,MPK,RZERND(20),CIRCDI(20),NI8P,NNI8P
COMMON IFLAG,3XX44
```

IFLAG=0

CIRC=CIRCD(ISP)

IZZ=0

DG=1.E-3

DP=1.E-5

I=0

DO-67-IIJ=1,4

67 WRITE(6,66) IIJ,X(IIJ)

66 FORMAT(1X,2HX(,11,2H)=,E14.7)

55 SI1=2.*DE

SI2=-1.-2.*DG

IF(X(1).LT.SI1) X(1)=SI1

IF(X(2).GT.SI2) X(2)=SI2

112 IF(X(2).LT.-9.) X(2)=-9.

SI4=X(1)+2.*DE*X(1)

IF(X(3).LT.SI4) X(3)=SI4

IF(X(3).GE.5.) X(3)=5.

SI5=X(3)+2.*DP*X(3)

IF(X(4).LT.-1.E-4) X(4)=X(3) & X(4)=X(4)-X(3) ARE USED.

X34A=ABS(X(4)-X(3))

IF(X34A.LT.X34LA) GO TO 171

IF(X(4).LT.0.) GO TO 1055

IF(X(4).LT.X34LA) GO TO 169

IF(IFLAG.EQ.1) GO TO 1065

IF(X(4).LT.SI5) X(4)=SI5

GO TO 170

1055 IFLAG=1

X(4)=X(4)*1.E-2

GO TO 170

169 IFLAG=1

GO TO 170

1065 IFLAG=0

X(4)=X(3)+X(4)

GO TO 170

171 X(4)=X34A

IFLAG=1

170 CONTINUE

DO 68 IIJ=1,4

68 WRITE(6,66) IIJ,X(IIJ)

PAI=3.141592653

IJ=1

IFIND F(1).

DO-20-IK=1,4

20 YXS(IK)=X(IK)

5 A1=YXS(1)+1.

A2=YXS(2)+1.

A3=YXS(3)+1.

A4=YXS(2)-YXS(1)

A5=YXS(3)-YXS(1)

B1=SQRT(YXS(1))

ADP2=A2

ADP1=A1

ADP4=A4

DOP1=-ADP1/(2.*DSQRT(ADP2*ADP4)+ADP2+ADP4)

```

D1=DOP1
D1LOG=ALOG(D1)
D2=A1/(2.*SQRT(A3*A5)+A3+A5)
D2LOG=ALOG(D2)
THA1=2.*B1
THA2=YXS(1)-1.
ATHA2=ABS(THA2)
THA=-ATAN(THA1/ATHA2)
IF(THA2.LT.0.) THA=-PAI-THA
D3=PAI+THA
ANS=SBETA
2 PA=- (CCC1*(D1LOG+D2LOG)+D3+ANS)
IF(IJ.EQ.1) F(1)=PA
IF(IJ.EQ.2) GO TO 3
IF(IJ.EQ.3) GO TO 4
P(1,2)=-CCC1/SQRT(A2*A4)
P(1,3)=-CCC1/SQRT(A3*A5)
IJ=2
YXS(1)=X(1)+DE
GO TO 5
3 FIP=PA
IJ=3
YXS(1)=X(1)-DE
GO TO 5
4 F10=-PA
P(1,1)=(FIP-F10)/(2.*DE)
P(1,4)=0.
C NEXT ABOUT F(2)
IJ=4
DO 30 IM=1,4
30 YXS(IM)=X(IM)
8 AA1=YXS(1)+1.
AA2=YXS(2)+1.
AA3=YXS(3)+1.
IF(IFLAG.EQ.1) YXS(4)=X(3)
AA4=YXS(4)+1.
AA5=YXS(2)-YXS(4)
AA6=YXS(4)-YXS(3)
IF(IFLAG.EQ.1) AA6=X(4)
AA7=YXS(4)-YXS(1)
AA8=YXS(2)-YXS(1)
AA9=YXS(3)-YXS(1)
BB11=AA1+AA5
BB1=AA4+AA7
BB2=AA2+AA8
BB3=AA3+AA9
SQBB1=SQRT(BB1)
SQBB2=SQRT(BB2)
SQBB3=SQRT(BB3)
BRL1=2.*SQRB2+SQRB1+YXS(4)*(AA2+AA8)+AA0-YXS(1)*AA2
DD1L0=ALOG(BB11/BRL1)
BRL2=AA1+AA6
BRL2=2.*SQRB3+SQRB1+YXS(4)*(AA3+AA9)+AA9-YXS(1)*AA3
DD2L0=ALOG(BB12/BRL2)
THB1=2.*SQRT(YXS(1))*SQRB1
THB2=YXS(1)*AA4-AA7
ATHB2=ABS(THB2)
THB=-ATAN(THB1/ATHB2)
IF(THB2.LT.0.) THB=-PAI-THB
PAT=PAI+THB
ANS1=SBETA
7 PR=- (CCC1*(DD1L0+DD2L0)+PAT+ANS1)
IF(IJ.EQ.4) F(2)=PR
IF(IJ.EQ.5) GO TO 9
IF(IJ.EQ.6) GO TO 10
IF(IJ.EQ.7) GO TO 11

```

```

IF(IJ,E0,8) GO TO 12
IF(IJ,E0,101) GO TO 427
IF(IJ,E0,102) GO TO 428
PP1=1./AA5
PP2=SQBH1*(AA2+AA8)/SQRB2+AA4+AA7
PP3=PP2/BB1
P(2,2)=CCC1*(PP1-PP3)
PP4=1./AA6
PP5=SQBH1*(AA3+AA9)/SQRB3+AA4+AA7
PP6=PP5/BB2
IF(IFLAG,E0,1) GO TO 425
P(2,3)=CCC1*(PP4-PP6)
GO TO 426
425 IJ=101
YXS(3)=X(3)+DF*X(3)
YXS(4)=YXS(3)
GO TO 8
427 P5P=-PB
IJ=102
YXS(3)=X(3)-DF*X(3)
YXS(4)=YXS(3)
GO TO 8
428 P5Q=-PB
P(2,3)=(P5P-P5Q)/(2.*DF*X(3))
426 CONTINUE
IJ=5
YXS(1)=X(1)+DE
GO TO 8
9 P2P=-PB
IJ=6
YXS(1)=X(1)-DE
GO TO 8
10 P2Q=-PB
P(2,1)=(P2P-P2Q)/(2.*DE)
IJ=7
YXS(1)=X(1)
IF(IFLAG,E0,1) GO TO 182
YXS(4)=X(4)+DF*X(4)
GO TO 8
11 P3P=-PB
IJ=8
YXS(4)=X(4)-DF*X(4)
GO TO 8
12 P3Q=-PB
P(2,4)=(P3P-P3Q)/(2.*DF*X(4))
GO TO 183
182 P(2,4)=CCC1/X(4)
183 CONTINUE
C-NEXT-F(3)
DO 40 IH=1,4
40 YXS(IH)=X(IH)
IF(IFLAG,E0,1) YXS(4)=X(3)
YA1=YXS(2)-YXS(4)
YA2=YXS(3)-YXS(4)
IF(IFLAG,E0,1) YA2=-X(4)
YY1=YA1/YA2
YY1L=ALOG(YY1)
HP=CIRCAPAT*YXS(4)/(ASPI*PSI2)
P(3)=-(YXS(2)-YXS(3)+YY1L*YXS(4)-HP)
P(3,1)=0.
YA3=YXS(4)/YA1
YA4=YXS(4)/YA2
P(3,2)=1.+YA3
P(3,3)=1.-YA4
IF(IFLAG,E0,1) P(3,3)=ALOG((YXS(3)-YXS(2))/YXS(4))+YXS(2)/
1 (YXS(3)-YXS(2))

```

```

      IF (IFLAG.EQ.1) GO TO 262
      P(3,4)=YY1L-YA3+YA4-HP/YXS(4)
      GO TO 263
262 P(3,4)=-YXS(3)/YXS(4)
263 CONTINUE
      C NEXT P(4).
      IJ=10
      YXS(1)=X(1)+DE
19 CALL NFSIM2(ANS2)
      IF (IJ.EQ.9) GO TO 75
      IF (IJ.EQ.10) GO TO 13
      IF (IJ.EQ.11) GO TO 14
      IF (IJ.EQ.12) GO TO 15
      IF (IJ.EQ.13) GO TO 16
      IF (IJ.EQ.14) GO TO 17
      IF (IJ.EQ.15) GO TO 18
      IF (IJ.EQ.16) GO TO 21
      IF (IJ.EQ.17) GO TO 22
13 ANS2=ANS2
      IJ=11
      YXS(1)=X(1)-DE
      GO TO 19
14 ANS2=ANS2
      P(4,1)=- (ANS2-ANS2)/(2.*DE)
      YXS(1)=X(1)
      IJ=9
      GO TO 19
75 ANS2=ANS2
      F(1)=- (BIG3-ANS2)
      IJ=12
      YXS(2)=X(2)+DG*ABS(X(2))
      GO TO 19
15 ANS2=ANS2
      IJ=13
      YXS(2)=X(2)-DG*ABS(X(2))
      GO TO 19
16 ANS2=ANS2
      P(4,2)=- (ANS2-ANS2)/(2.*DG*ABS(X(2)))
      YXS(2)=X(2)
      IJ=14
      YXS(3)=X(3)+DF*X(3)
      IF (IFLAG.EQ.1) YXS(4)=YXS(3)
      GO TO 19
17 ANS2=ANS2
      IJ=15
      YXS(3)=X(3)-DF*X(3)
      IF (IFLAG.EQ.1) YXS(4)=YXS(3)
      GO TO 19
18 ANS2=ANS2
      P(4,3)=- (ANS2-ANS2)/(2.*DF*X(3))
      YXS(3)=X(3)
      IF (IFLAG.EQ.1) GO TO 371
      IJ=16
      YXS(4)=X(4)+DF*X(4)
      GO TO 19
21 ANS2=ANS2
      IJ=17
      YXS(4)=X(4)-DF*X(4)
      GO TO 19
22 ANS2=ANS2
      P(4,4)=- (ANS2-ANS2)/(2.*DF*X(4))
      YXS(4)=X(4)
      GO TO 372
371 P(4,4)=0.
372 CONTINUE
      CALL DETERM(P,4,DETN)

```

```

DO 25 IDET=1,4
DO 26 LPG=1,4
Q(LPG,IDET)=P(LPG,IDET)
26 P(LPG,IDET)=R(LPG)
CALL DETERM(P,A,DETE)
IF(IDET.EQ.1) DELB=DETE/DETB0
IF(IDET.EQ.2) DELC=DETE/DETB0
IF(IDET.EQ.3) DELD=DETE/DETB0
IF(IDET.EQ.4) DELJ=DETE/DETB0
DO 27 LPG=1,4
27 P(LPG,IDET)=Q(LPG,IDET)
25 CONTINUE
X40=X(4)
X(1)=X(1)+DELB
X(2)=X(2)+DELC
X(3)=X(3)+DELD
X(4)=X(4)+DELJ
DO 60 LMN=1,4
60 WRITE(6,61) LMN,X(LMN)
61 FORMAT(1X,2HX(,11,2H)=,E14,7)
ABSB=ABS(DELB/X(1))
ABSC=ABS(DELC/X(2))
ABSD=ABS(DELD/X(3))
ABSJ=ABS(DELJ/X(4))
KEIN=0
IF(ABSB.LT.STOL) KEIN=1
IF(ABSC.GT.STOL) KEIN=0
IF(ABSD.GT.STOL) KEIN=0
IF(ABSJ.GT.STOL) KEIN=0
IF(KEIN.EQ.1) GO TO 35
I=I+1
WRITE(6,42) I
42 FORMAT(20X,14HITERATION NO.,=,I2)
IF(I.EQ.M) GO TO 35
GO TO 55
35 IF(I.EQ.M) GO TO 36
GO TO 38
36 WRITE(6,37)
37 FORMAT(1X,34HNOXPNEW DID NOT CONVERGE WITHIN 'M')
IF(X(1).LT.SI1) X(1)=SI1
IF(X(2).GT.SI2) X(2)=SI2
IF(X(2).LT.-9.) X(2)=-9.
SI4=X(1)+2.*DEB*X(1)
IF(X(3).LT.SI4) X(3)=SI4
IF(X(3).GE.5.) X(3)=5.
SI5=X(3)+2.*ADP*X(3)
IF(X(4).LT.0.) GO TO 1152
IF(IFLAG.EQ.1) GO TO 380
IF(X(4).LT.SI5) X(4)=SI5
380 CONTINUE
1152 X(4)=X40*1.E-2
38 DO 129 ITX=1,4
129 WRITE(6,131) ITX,F(ITX)
131 FORMAT(1X,2HF(,11,2H)=,E14,7)
DO 132 IUP=1,4
DO 132 IU0=1,4
132 WRITE(6,133) IUP,IU0,P(IUP,IU0)
133 FORMAT(1X,2HF(,11,1H,,11,2H)=,E14,7)
RETURN
END

SUBROUTINE XINTER(X,XG,YG,ICONT)
COMMON FLAPAN,CLD,CIRCD(20),HHH,ALFA2,SIGMA,SBETA,XXH,ICPI
COMMON IDIL,XA,XB,XC,TANG,EP,YC,YR,UBIGS,XLBIGS,BIGS,SMALS,SSS
COMMON X3N(5),CCC1,CLE,ERC,YYY,XM,ITERA,XXSIN(5),XXSIN(5),YXS(5)
COMMON NSIZ,LP,SARC(513),SARCO(513),LPM,DE,ISP,ASPI,TIII
COMMON BETAN(513),BETAM(513),II-LPK,XII(200),XJJ(200),XOX

```

COMMON AN(7),MPM,MPK,RZEROD(20),CIRCOT(20),NI8P,NNI8P

COMMON IFLAG,SXX44

PAI=3.141592653

A1=XSN(1)+1.

A2=XSN(2)-X

A3=XSN(2)+1.

A4=XSN(2)-XSN(1)

A5=X+1.

A6=X-XSN(1)

B2=XSN(3)-X

B3=XSN(3)+1.

B4=XSN(3)-XSN(1)

IF(ICONT,EQ.4) A2=-A2

IF(ICONT,EQ.4) B2=-B2

IF(ICONT,EQ.5) B2=-B2

C1=A1*A2

C2=SQRT(A3*A4*A5*A6)

C3=X*(A3+A4)

C4=A4-XSN(1)*A3

D1=A1*B2

D2=SQRT(B3*B4*A5*A6)

D3=X*(B3+B4)

D4=B4-XSN(1)*B3

G1=C1/(2.*C2+C3+C4)

F1=D1/(2.*D2+D3+D4)

SIN1=CCC1*(ALOG(G1)+ALOG(F1))

IF(ICONT,EQ.4) SIN1=-SIN1

AAU=X*(XSN(1)-1.)*2.*XSN(1)

AAL=X*A1

IF(ICONT,EQ.4) AAL=-AAL

BCD=AAU/AAL

THP=ARCSIN(BCD)

IF(ICONT,EQ.4) THP=-THP

TH2=0.5*PAI+THP

H1=-SQRT(A5*A6)/P

IF(ICONT,EQ.4) H1=-H1

XUX=X

CALL NFSIM1(ANSA,ICONT)

SIN2=H1*ANSA

SSA=SIN1+TH2+SIN2

COSS=COS(SSA)

SISS=SIN(SSA)

XSN4=XSN(4)

IF(IFLAG,EQ.1) XSN4=XSN(3)+SXX44

SPN=-PSIZ*X/(XSN4 *PAI*(X-XSN4))

XG=COSS*SPN

YG=SISS*SPN

RETURN

END

SUBROUTINE PCN1(P,TOP,XOK,YOK,NY)

DIMENSION XST(5)

COMMON FLAPAN,CLD,CIRCOT(20),MMH,ALFAZ,SIGMA,SBETA,XXM,ICPI

COMMON IDIH,XA,XB,XG,TANG,EP,YC,YR,UBIGS,XLBIGS,BIGS,SMALS,SSS

COMMON XSN(5),CCC1,CLE,ERC,YYY,XM,ITERA,XXSIN(5),XXSIOO(5),YXS(5)

COMMON PSIZ,LP,SARC(513),SARC(513),LPM,DE,ISP,ASPI,IIII

COMMON BETAN(513),BETAM(513),IJ,LPK,XII(200),XJJ(200),XOX

COMMON AN(7),MPM,MPK,RZEROD(20),CIRCOT(20),NI8P,NNI8P

COMMON IFLAG,SXX44

PAI=3.141592653

SI=P/PLNAT(NY)

C FIRST FIND XKI IN P25-1.

XOK=0.

YOK=0.

XOK=0.

```

YOK=0.
DO 10 I=1,NY
R=SI*FLOAT(I)
A=R*CNS(TOP)-XSN(4)
B=R*SIN(TOP)
R2=SQRT(A**2+B**2)
T2=ATAN(B/A)
IF(A.LE.0.) T2=PAI+T2
XK1=-PSIZ*R/(PAI*XSN(4)*R2)

```

C NEXT CALCULATE IM S RE.

```

AA=R*CNS(TOP)+1.
BB=R*CNS(TOP)-XSN(1)
CC=R*SIN(TOP)
RA=SQRT(AA**2+CC**2)
RB=SQRT(BB**2+CC**2)
R1=SQRT(RA*RB)
THA=ATAN(CC/AA)
THB=ATAN(CC/BB)
IF(AA.LE.0.) THA=PAI+THA
IF(BB.LE.0.) THB=PAI+THB
T1=0.5*(THA+THB)
XRR=0.
XMM=0.

```

```

DO 6 MIQ=1,4
CALL RMINT(AAR,AAM,MIQ,R,TOR)

```

```

IF(MIQ.EQ.1) XR=-CCC1*AAR
IF(MIQ.EQ.1) XM=-CCC1*AAM
IF(MIQ.EQ.2) XR=CCC1*AAR
IF(MIQ.EQ.2) XM=CCC1*AAM
IF(MIQ.EQ.3) XR=-AAR/PAI
IF(MIQ.EQ.3) XM=-AAM/PAI
IF(MIQ.EQ.4) XR=-AAR
IF(MIQ.EQ.4) XM=-AAM

```

```

XRR=XRR+XR

```

```

6 XMM=XMM+XM

```

```

PIM=R1*(XRR*ASIN(T1)+XMM*CNS(T1))

```

```

PRE=R1*(XRR*CNS(T1)-XMM*ASIN(T1))

```

```

EX1=EXP(-PIM)

```

```

ARI=PRE+2.*TOP-T2

```

```

ODD=ASPI*XK1*EX1

```

```

XOK=ODD*CNS(ARI)

```

```

YOK=ODD*SIN(ARI)

```

```

XOK=(XOKK+XOK)*0.5*SI+XOK

```

```

YOK=(YOKK+YOK)*0.5*SI+YOK

```

```

XOKK=XOK

```

```

10 YOKK=YOK

```

```

RETURN

```

```

END

```

```

SUBROUTINE RMINT(SR,SM,MIQ,R,TOR)

```

```

DIMENSION RNT(200),XST(5),XKER1(200),XKER2(200),XKERM(200)

```

```

DIMENSION XKERR(200)

```

```

COMMON FLAPAN,CLD,CIRCD(20),MMH,ALFAZ,SIGMA,SBETA,XXM,ICPI

```

```

COMMON IDUL,XA,XB,XC,TANG,FP,YC,YR,URIGG,XLBIGS,BIGS,SMALS,SSS

```

```

COMMON XSN(5),CCC1,CLE,ERC,YYY,XM,ITERA,SXSIN(5),SXSIO(5),XYS(5)

```

```

COMMON PSIZ,LP,SARC(513),SARCN(513),LPM,DE,ISP,ASPI,III

```

```

COMMON BETAN(513),BETAM(513),IJ,LPK,XTI(200),XJJ(200),XOX

```

```

COMMON AN(7),MPM,MPK,RZEROD(20),CIRCDI(20),NISP,NNISP

```

```

COMMON IFLAG,3XX44

```

```

PAI=3.141592653

```

```

LRM3=LRM-3

```

```

IF(ICPI.EQ.0) GO TO 10

```

```

DO 12 IN=1,4

```

```

12 XST(IN)=XSN(IN)

```

```

GO TO 11

```

```

10 DO 1 IS=1,4

```

```

1 XST(75)=YXS(75)
11 XX1=R*ACS(TNO)
   YY1=R*SIN(TNO)
   SP1=-1.-XST(2)
   SP2=XST(3)-XST(1)
   SP3=XST(1)+1.
   SP4=XST(1)
   IF(MIQ.EQ.3) GO TO 2
   IF(MIQ.EQ.1) SINC=SP1/21.
   IF(MIQ.EQ.2) SINC=SP2/21.
   IF(MIQ.EQ.4) SINC=SP4/21.
   IF(MIQ.EQ.1) XSTAR=XST(2)
   IF(MIQ.EQ.2) XSTAR=XST(1)+SINC
   IF(MIQ.EQ.4) XSTAR=0.
   DO 3 ITP=1,21
   XYIN=XSTAR+FLOAT(ITP-1)*SINC
   XINS=XYIN-XST(1)
   IF(MIQ.EQ.4) XINS=-XINS
   PT=SQRT((XYIN+1.)*XINS)
   PIJ=(XYIN-XX1)**2+YY1**2
   XKER1(ITP)=1./(PT*PIJ)
3  XKER2(ITP)=(XYIN-XX1)*XKER1(ITP)
   SR=0.
   SM=0.
   DO 4 ILO=1,19,2
   SR=SR+SINC*(XKER2(ILO)+4.*XKER2(ILO+1)+XKER2(ILO+2))/3.
4  SM=SM+SINC*(XKER1(ILO)+4.*XKER1(ILO+1)+XKER1(ILO+2))/3.
   SM=SM*YY1
   IF(MIQ.EQ.1) ADD=2.*SQRT(SINC)/(((XST(1)-XX1)**2+YY1**2)*
   XSORT(1.+XST(1)))
   IF(MIQ.EQ.2) ADD=2.*SQRT(SINC)/(((XST(1)-XX1)**2+YY1**2)*
   XSORT(XST(1)+1.))
   IF(MIQ.EQ.4) ADD=2.*SQRT(SINC)/(((XST(1)-XX1)**2+YY1**2)*
   XSORT(1.+XST(1)))
   IF(MIQ.EQ.1) ATOP=-1.-XX1
   IF(MIQ.EQ.2) ATOP=XST(1)-XX1
   IF(MIQ.EQ.4) ATOP=XST(1)-XX1
   SH=SR+ADD*ATOP
   SM=SM+ADD*YY1
   GO TO 5
0  2  CSPACE=(1.+XST(1))/FLOAT(LPK)
   FSPACE=CSPACE/FLOAT(LPM-LPK)
   LPM=LPM-1
   XIIT=-1.+CSPACE*FLOAT(LPK-1)
   DO 6 KIK=2,LPM
   SPACE=CSPACE
   IF(KIK.GT.LPK) SPACE=FSPACE
   XF1=-1.+SPACE*FLOAT(KIK-1)
   IF(KIK.GT.LPK) XF1=XIIT+FLOAT(KIK-LPK)*SPACE
   IF(ITERA.EQ.1) GO TO 20
   XTOPR=BETAN(KIK)*(XF1-XX1)
   XTOPM=BETAN(KIK)*YY1
   GO TO 21
20  XTOPR=SBETA*(XF1-XX1)
   XTOPM=SBETA*YY1
21  XBNTA=SQRT((1.+XF1)*(XST(1)-XF1))
   XBNTB=(XF1-XX1)**2+YY1**2
   XBNT=XBNTA/XBNTB
   XKERR(KIK)=XTOPR/XBNT
6  XKERM(KIK)=XTOPM/XBNT
   SR=0.
   SM=0.
   DO 7 KIM=2,LPM3,2
   SPACE=CSPACE
   IF(KIM.GE.LPK) SPACE=FSPACE
   SR=SR+SPACE*(XKERR(KIM)+4.*XKERR(KIM+1)+XKERR(KIM+2))/3.

```

```

7 SM=SM+SPACE*(XKERM(KIM)+4.*XKERM(KIM+1)+XKERM(KIM+2))/3.
  SIB=SQRT(1.+XST(1))
  BADD1=BETAN(1)
  BADD8=BETAN(LPM)
  IF(ITERA.EQ.1) BADD1=SBETA
  IF(ITERA.EQ.1) BADD8=SBETA
  ADD1=BADD1+2.*SQRT(CSPACE)/(SIB*((-1.-XX1)**2+YY1**2))
  ADD8=BADD8+2.*SQRT(FSPACE)/(SIB*((XST(1)-XX1)**2+YY1**2))
  SR=SR+ADD1*(-1.-XX1)+ADD8*(XST(1)-XX1)
  SM=SM+ADD1*YY1+ADD8*YY1
5 RETURN
END

```

```

SUBROUTINE COEF(G,A)
C COEFFICIENTS OF FOURIER SINE SERIES.
  DIMENSION G(4),A(7),P(50,7),Q(50,7)
  COMMON FLAPAN,CLD,CIRCD(20),HHH,ALFAZ,SIGMA,SBETA,XXM,ICPI
  COMMON IDUL,XA,XB,XC,TANG,EP,YC,YR,UBIGS,XLBIGS,BIGS,SMALS,SSS
  COMMON XSN(5),CCC1,CLE,ERC,YYY,XM,ITERA,SXSIN(5),SXSIOO(5),YXS(5)
  COMMON PSIZ,LP,SARC(513),SARCO(513),LPM,DE,ISP,ASPI,IIII
  COMMON BETAN(513),BETAM(513),IJ,LPK,XII(200),XJJ(200),XOX
  COMMON AN(7),MPM,MPK,RZERND(20),CIRCOI(20),NISP,NNISP
  COMMON IFLAG,SXX44
  PAI=3.141592653
  DO 1 I=1,7
  DO 1 J=1,7
1 P(I,J)=SIN(PAI*FLOAT(I)) *FLOAT(J)/8.)
  IF(NISP.GE.1) GO TO 6
  DO 7 KN=1,7
  P(1,KN)=SIN((PAI/8.+FLOAT(NNISP)*PAI/64.)*FLOAT(KN))
7 P(7,KN)=SIN((PAI-PAI/8.-FLOAT(NNISP)*PAI/64.)*FLOAT(KN))
6 CONTINUE
  CALL DETERM(P,7,8)
  DO 2 I=1,7
  DO 3 J=1,7
  Q(J,I)=P(J,I)
  IF(J.GE.5) GO TO 5
  P(J,I)=Q(5-J)
  GO TO 3
5 P(J,I)=Q(J-3)
3 CONTINUE
  CALL DETERM(P,7,C)
  A(I)=C/8
  DO 4 K=1,7
  P(K,I)=Q(K,I)
2 CONTINUE
  RETURN
END

```

```

SUBROUTINE GAM1(C,A)
  DIMENSION C(10),A(10),XS(10)
  COMMON FLAPAN,CLD,CIRCD(20),HHH,ALFAZ,SIGMA,SBETA,XXM,ICPI
  COMMON IDUL,XA,XB,XC,TANG,EP,YC,YR,UBIGS,XLBIGS,BIGS,SMALS,SSS
  COMMON XSN(5),CCC1,CLE,ERC,YYY,XM,ITERA,SXSIN(5),SXSIOO(5),YXS(5)
  COMMON PSIZ,LP,SARC(513),SARCO(513),LPM,DE,ISP,ASPI,IIII
  COMMON BETAN(513),BETAM(513),IJ,LPK,XII(200),XJJ(200),XOX
  COMMON AN(7),MPM,MPK,RZERND(20),CIRCOI(20),NISP,NNISP
  COMMON IFLAG,SXX44
  PAI=3.141592653
  DO 1 I=1,4
  C(5-I)=0.
  XS(I)=PAI/16.+FLOAT(I-1)*PAI/8.
  IF(NISP.EQ.0) XS(1)=.5*(PAI/8.+PAI*FLOAT(NNISP)/64.)
  IF(NISP.EQ.0) XS(2)=PAI/4.-.5*(PAI/4.-2.*XS(1))
  DO 1 J=1,7
1 C(5-I)=C(5-I)+A(J)*SIN(XS(I)) *FLOAT(J))
  RETURN

```

Note: AITKEN and DETERM (both are Caltech subroutines)
are not listed, although they are included in the deck.